140-44

August 1982
vol 8, no 8
$2.95

40 New Games!
In-depth Evaluations

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11 Joysticks: Don't
Play Games Without One

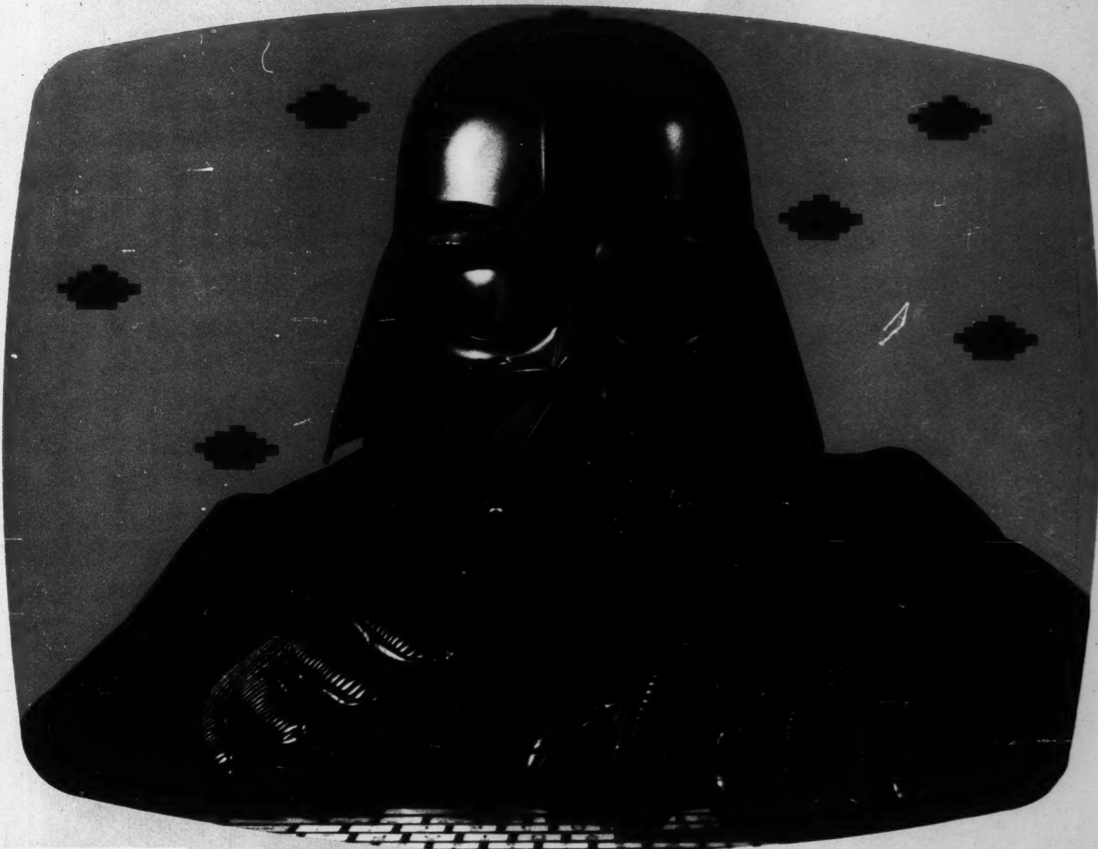
10 Complete Games for
IBM, Apple, Pet, TRS-80, others

Game Designers Tell
How They Do It

Adventure Games:
More Graphics, Greater Challenge

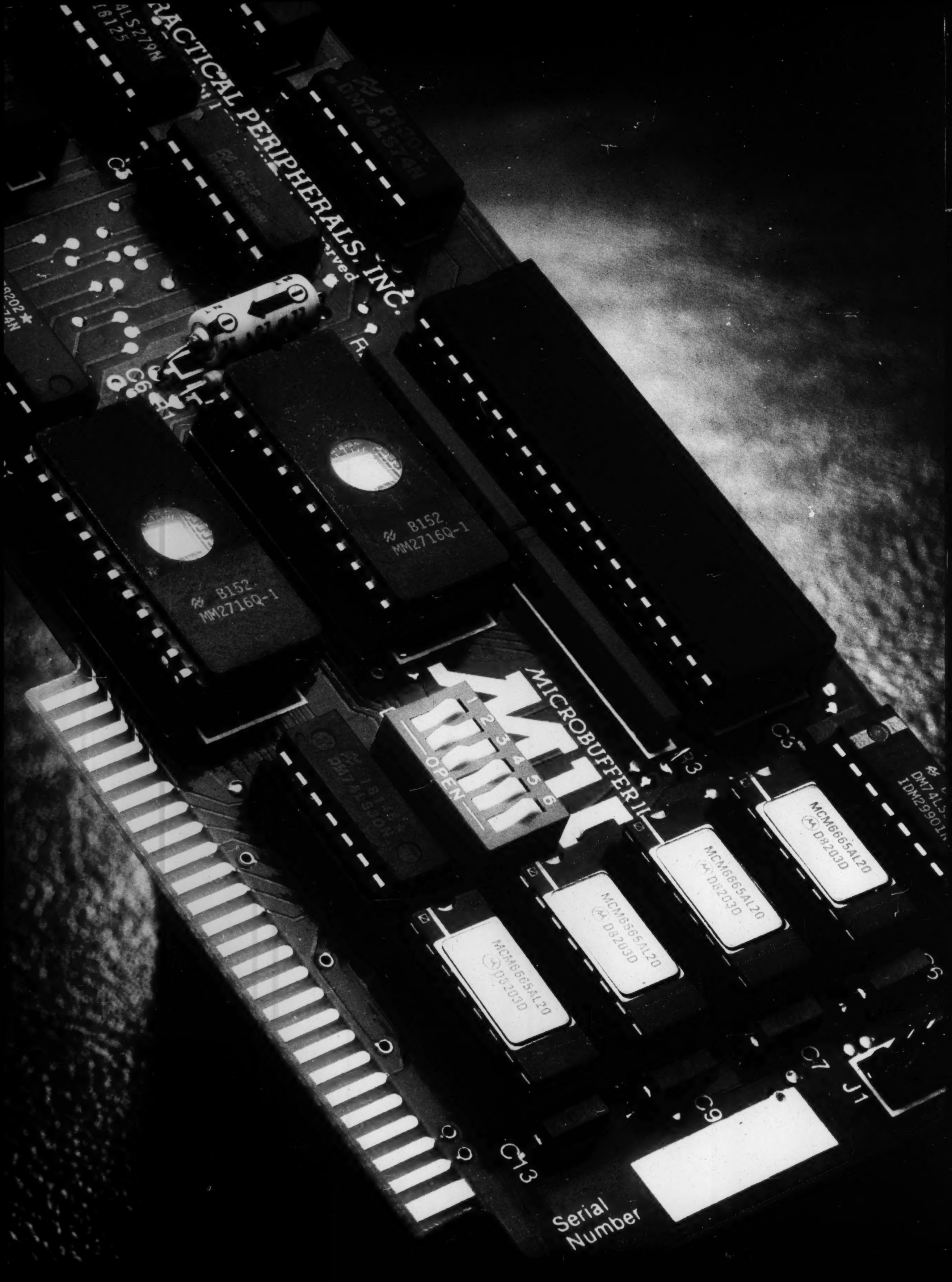
Apple Graphics: Second in a Series

Writing Effectively



What's New From the West Coast Computer Faire

Columns: New Products, Apple, Atari, IBM, Pet, Books, I/O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Volume 8, Number 8

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the cover

The cover reflects the emphasis of this issue: games. This month we feature arcade games, adventure games, and war games to buy or type in yourself, as well as tips for writing your own.

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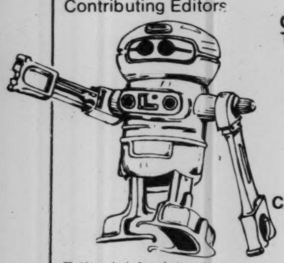

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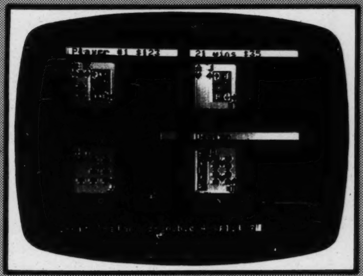

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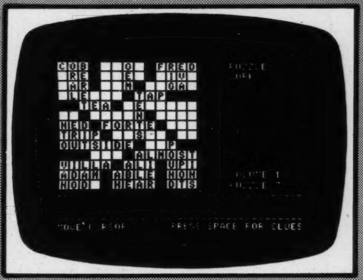
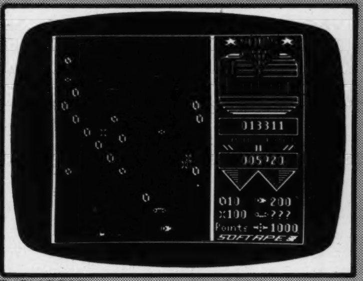
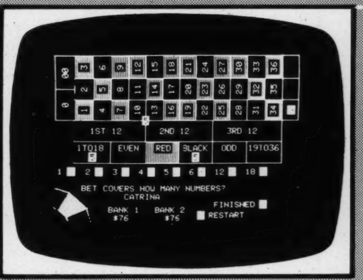

PRESS SPACE FOR CLUES

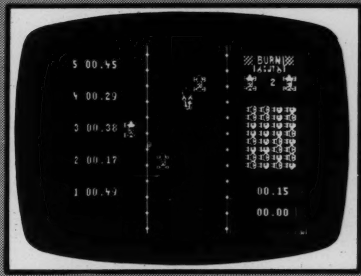
2. CROSSWORDS


013311
005923
Points
SOFTAPE

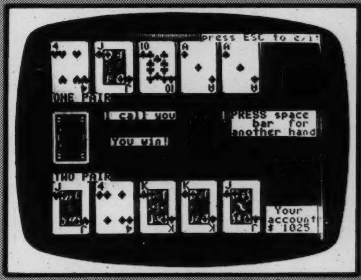
3. PHOTAR


1ST 12
2ND 12
3RD 12
1TO18
EVEN
RED
BLACK
ODD
19TO36
BET COVERS HOW MANY NUMBERS?
CATRINA
BANK 1 $76
BANK 2 $76
FINISHED
RESTART

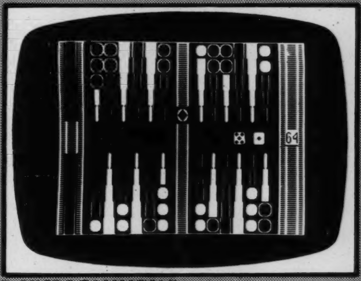
4. ROULETTE


5 00.45
4 00.29
3 00.38
2 00.17
1 00.47
BURN
00.15
00.00

5. BAKER'S TRILOGY

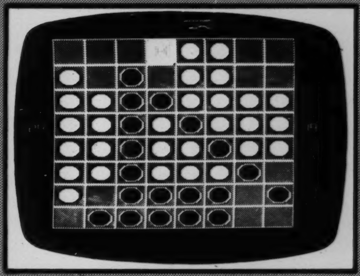

press ESC to exit
ONE PAIR
I call you
You win!
PRESS space bar for another hand
TWO PAIR
Your account $ 1025

6. DRAW POKER

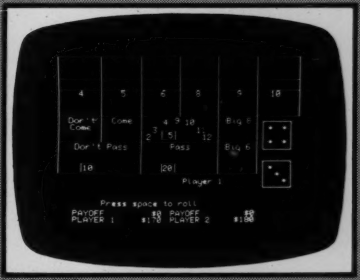


7. MICROGAMMON II

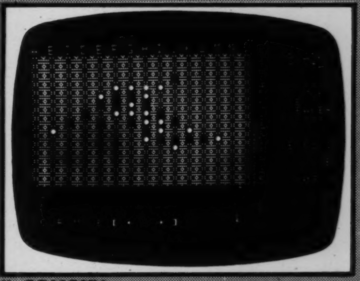
8. BEST OF BISHOP



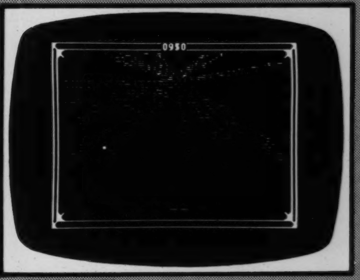
9. REVERSI


Don't Come
Come
Don't Pass
Pass
Big 6
Big 8
Player 1
Press space to roll
PAYOFF PLAYER 1 $170
PAYOFF PLAYER 2 $180

10. CRAPS



11. GOMOKU



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Attention: Stamp Collectors

Philatelists will be interested in the comprehensive 8-page list of stamps about computers assembled by Robert Boos. It lists stamps depicting computers, people who contributed to the development of computers, and related topics. It includes stamps depicting computers but not issued to commemorate a computer-related event. Curiously, computer-oriented countries such as the U.S. and Japan have issued fewer stamps on the topic than countries such as Romania and the Netherlands.

The list is free. Send a self-addressed #10 envelope with 56 cents postage to Robert V. Boos, 34 Santa Barbara Drive, Plainview, NY 11803.

The Us Festival

Three of the major cultural forces of the 80's—technology, music and education—will meet over Labor Day Weekend at the Us Festival planned by Stephen Wozniak, co-founder and inventor of Apple Computers.

The three-day event, designed to be enjoyed by entire families as well as individuals, will usher in the Us Decade through a musical extravaganza and a Technology Fair. Over 300,000 people are expected to participate each day.

The Technology Fair will feature exhibits of new applications of computer technology as it relates to communications, education, small business, music and ecology. The Fair will provide an opportunity, in a non-commercial environment, for new entrepreneurs and major companies to show off some of their latest developments which have the potential to bring people and ideas closer together.

In addition, the Fair will feature an innovative Comp-U-Olympics—a problem-solving competition designed especially for computer user groups.

For those unable to attend, a specially created Us Network will telecast the event live to theaters and homes throughout America.

Plans are being finalized for the Southern California location. Interested parties can order tickets by using The Source #TCW 314 or writing The Us Festival, P.O. Box 95108-1157, San Jose, CA 95108.

The World Responds, or An Embarrassment of Reviewers

We wish to extend our thanks to the many of you that have contributed to the overwhelming response received concerning our "Embarrassment of Riches," the call for reviewers in our May issue.

Some of you have heard from us by now, and are busily evaluating new hardware and software products for *Creative Computing*.

Unfortunately, due to the enormous number of letters received, we will be unable to respond to each personally.

If you are among those who have not heard from us, please accept our thanks here for the effort. We have learned a great deal from you concerning the kinds of articles you are interested in and the directions you would like to see the magazine take. Your letters will be kept on file at *Creative Computing*, so don't be too surprised if you hear from us even some months from now, when we discover a need for a reviewer with your qualifications.

Meanwhile, whether or not you're chosen as a guest contributor, keep those cards and letters coming in, so we'll know how best to meet the desires of our readership.

Corrections

There is an error in the article "Upper and Lower Case for Your Model 1" from the June 1982 issue. All references to the shift-down arrow, excluding the reference to the "New-ROM" in the 7th paragraph, should be changed to shift-*right* arrow.

In "A Pseudo Word Processor" (June 1982, page 178) there were two errors. The reference to line 221 in the middle column should be line 710, and GOTO 62 should be GOTO 90.

There were three incorrect lines in the article "Financial Aid" from the May, 1982 issue.

Line 20290 should read:

```
20290 IF B5 < 50001 THEN B4=B5* .4
```

This change affects the outcome for dependent students in some situations. Sample cases 1 and 2 are not affected, but after the change the following results should be obtained for Dependent Case 3:

Parent Contribution	
From Income	$ 983
From Assets	279
Total Parent Contribution	1,262
Student Contribution	
Summer Savings	$ 700
Social Security	0
V.A. Benefits	480
Other Benefits	500
From Assets	0
Total Student Contribution	1,680
Total Family Contribution	$2,942

In addition, lines 25010 and 30302 should be changed as follows:

```
25010 A1=I(29) + (30) +I (31) +I (32)

30302 H=INT (I(21)*.35) : GOSUB 40900
```

This changes the results for independent students. The corrected results for the two Independent Student Cases are as follows:

	Case 1	Case 2
Parent Contribution		
From Income	0	0
From Assets	0	0
Total Parent Contribution	0	0
Student Contribution		
From Earnings	6,472	9,975
Social Security	2,400	0
VA Benefits	0	1,350
Other Benefits	0	0
From Assets	699	1,259
Total Student Contribution	9,571	12,584
Total Family Contribution	$9,571	$12,584

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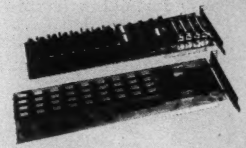

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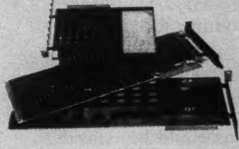

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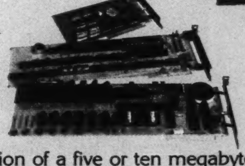

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UNMATCHED EXPANSION for the serious IBM Personal Computer user through these and the many other TECMAR Expansion products available through participating COMPUTERLAND stores, and other fine computer retailers nationwide.

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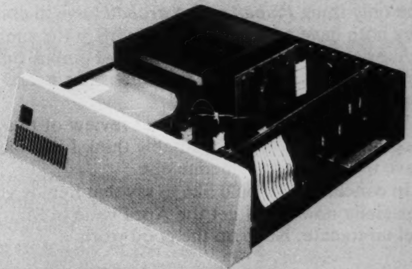

For IBM Personal Computer Expansion, TAKE THE NEXT STEP . . .

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PERSONAL COMPUTER PRODUCTS DIVISION
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Telephone: (216) 464-7410 Telex: 241735

CIRCLE 247 ON READER SERVICE CARD

utput...input/output...inpu

The Pins Are Flying

Dear Editor:

With regard to your review of my *Tenpins* program on page 220 of your April '82 issue, I think the evaluation of *Tenpins* was very fair and I am sending these notes for general interest.

The first working versions of *Tenpins* did a full calculation of which pins hit which and hence looked after the 4-6, 7-9, 8-10 and even the famous 7-10 splits. Unfortunately the program was 24K long and the ball had a rest as it went through the pins, whilst the Z-80 did all the calculations.

As I did not know many people with 32K tape systems something had to go. Cleaning up the code got it down to about 22K, then a pseudo interpreter was written to draw the blind moving up and down, thus saving another 500 bytes.

A compressor was made so that when the screen is saved to display the scoreboard the screen can be compressed to 300 bytes from 1000 bytes, but it took 100 bytes for a saving of 600 bytes—20.9K still 4.9K to go.

The only things eating up core (sorry, RAM) were the calculations as the ball went through the pins. Instead of the inline code I wrote a generalized subroutine for any pin, which reduced the code by about 8K. The catch was that you could now go for a beer while the ball negotiated the pins.

So what the heck, I was writing a game not an Apollo mission, the true mathematical calculations had to become approximations, and only the nearest pins could be considered. This got me to 16K, but sorry to say no difficult splits.

As for pins flying through the air, I guess you'll have to go to the local bowling alley, because I don't have enough RAM or real time left, unless you like lots of beer while you wait.

Now for the real reason of this letter, the review of *Astroball* on page 222 in four words was most unfair. *Astroball* is not "*Pinball* with added features."

I can only assume the misconception arose from the ads. The only thing *Pinball* and *Astroball* have in common is that they both have a ball and flippers; there the similarities end.

Astroball is the second in a series of pinball (with a small p) simulations. Unfortunately the first was called *Pinball* and hence the confusion.

While I could write a fantastic review of this phenomenal program, people might justifiably think I was biased, so I will leave the review to someone else.

In concluding I would like to say that I enjoy your magazine especially now that I get the April issue in March—at least I feel up-to-date. Keep up the good work.

John Allen
16 Jackson Court
Kanata, Ontario
Canada, K2K 1B7

Prescription For Programmers

Dear Editor:

I am preparing a book on the use of Microcomputers in Medicine. I propose to publish various programs used in medicine and would appreciate hearing from your readers who have written useful programs and would be interested in having them included in this book.

The programs will include file organization of medical records, data extraction, file statistics and general statistics used in medical research, graphic plotting of research data, patient history taking and history summarization, patient scheduling, and billing routines.

I plan to publish the programs for the Apple II, Commodore PET, and the TRS-80.

I would be interested in hearing from your readers.

Derek Enlander, M.D.
Department of Nuclear Medicine
NYU Medical Center
560 1st. Ave.
New York, NY 10016

No Service For The Service

Dear Editor:

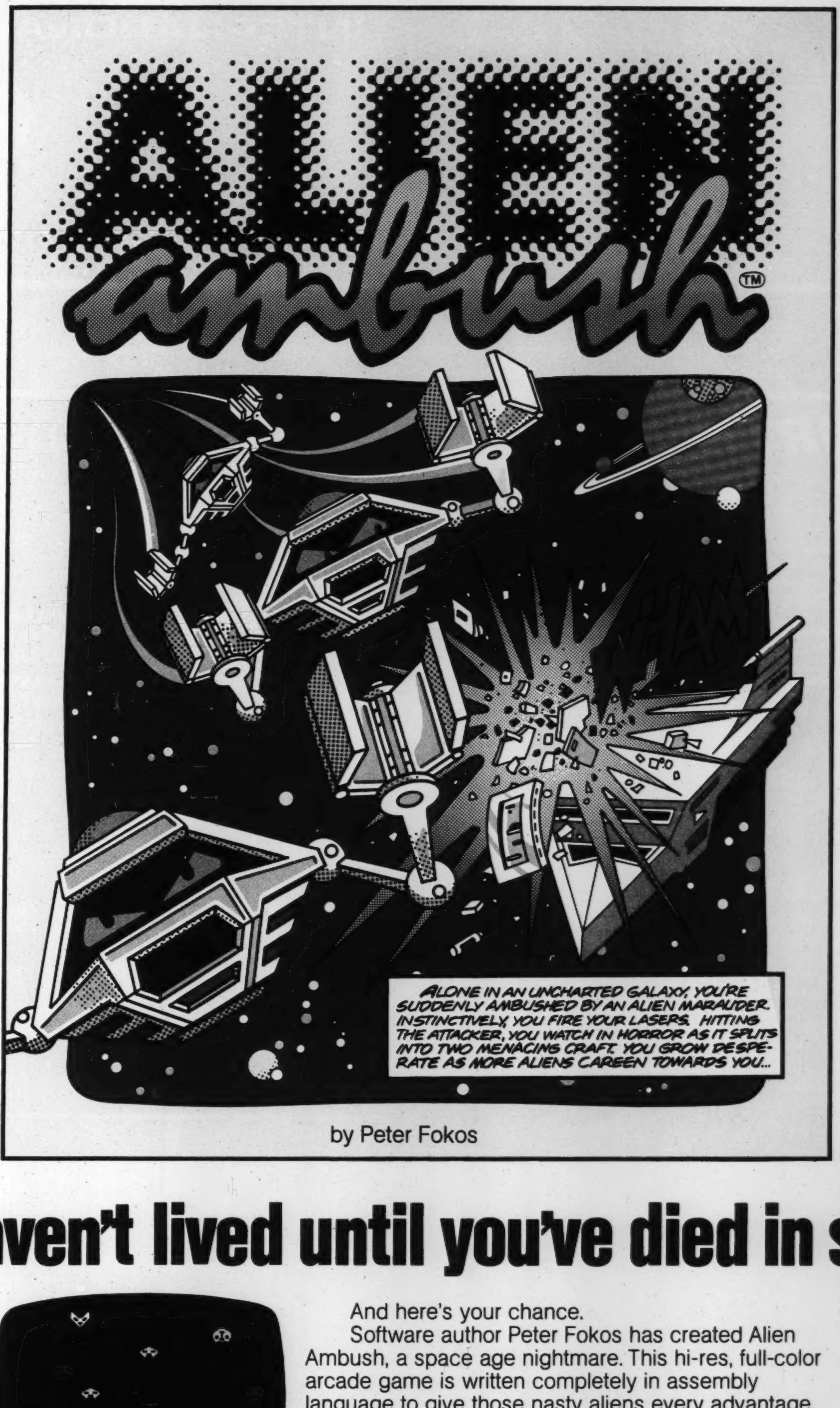
To the overseas G.I., mail order is a way of life. We must order all items we cannot get at the local exchange. This includes odd-size clothes, left-handed monkey wrenches, and computers. That last item is where the rub comes in.

Overseas servicemen and women all over the world have recently been disenfranchised by Apple's decision to halt mail order sales of its products.

Here in Japan, we have several large computer clubs, many members of which are Apple owners. Those of us who already own Apples are restricted to whatever hardware we had before Apple lowered the boom on us. Those who intended to get Apples are turning to other computers, or to Japanese kits—not by choice, but by necessity.

We would like to ask Apple to reconsider its decision. If they can't relent for everyone, at least give U.S. service members overseas a break by allowing mail order sales to APO/FPO addresses. We would hate to think that the manufacturer of such a popular product could go from personal service and friendliness to the user to cold, uncaring corporate giant in such a short time.

Bob Lantz (USAF)
Okinawa Computer Club
Okinawa, Japan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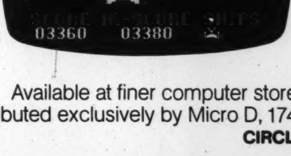
ALONE IN AN UNCHARTED GALAXY, YOU'RE SUDDENLY AMBUSHED BY AN ALIEN MARAUDER. INSTINCTIVELY, YOU FIRE YOUR LASERS. HITTING THE ATTACKER, YOU WATCH IN HORROR AS IT SPLITS INTO TWO MENACING CRAFT. YOU GROW DESPERATE AS MORE ALIENS CAREEN TOWARDS YOU...
by Peter Fokos

You haven't lived until you've died in space.


SCORE HI-SCORE SHIPS
03360 03380

And here's your chance.

Software author Peter Fokos has created Alien Ambush, a space age nightmare. This hi-res, full-color arcade game is written completely in assembly language to give those nasty aliens every advantage.

So if you have access to a 48K Apple* with DOS 3.3, and you're hot for some new thrills, Alien Ambush was written for you. But be warned: It just got a lot tougher to survive in space.

Available at finer computer stores everywhere. *Apple is a trademark of Apple Computer, Inc.
Distributed exclusively by Micro D, 17406 Mt. Cliffwood Circle, Fountain Valley, CA 92708 (714) 540-4781

CIRCLE 188 ON READER SERVICE CARD

VALPAR INTERNATIONAL

Admit it. We're jealous! We've all wished we could produce the mesmerizing graphics and irresistible games that the Atari is capable of handling. But it's not happening in Basic—and few of us can spend months writing machine code . . . even if we know how.

The answer is Forth—the same high-level language used by Atari and others to program their arcade machines. Forth is *fast*, 15 to 20 times faster than Basic, and can make use of *every* capability of your computer. And it's no longer the province of the professional programmer!

Easy, *almost automatic*, access to graphics, animation, sound, and text handling can *now* be yours with ValForth and the additional packages, allowing you to create programs in an afternoon that would previously have taken weeks of hard work. And, unlike machine language programs, ValForth programs can be changed easily where you want to fine tune a particular effect or operation. Revisions that would be infuriating in machine language become trivial with ValForth.

WHAT? YOU DON'T ALREADY KNOW FORTH?

Then take advantage of our special offer on "Starting Forth" by Brodie. Widely acclaimed as the best book available on the subject, this entertaining treatment of Forth will make you comfortable with this exciting language quickly and easily. When you order *Starting Forth* you get a free copy of our "Notes for the ValForth User," including references, by page, to *Starting Forth*.

valFORTH

ValForth is an improved version of Atari's APX Forth and is upwardly compatible with it. ValForth was written by Steve Maguire and Evan Rosen of Valpar International in conjunction with Patrick Mullarky, the author of APX Forth. Specific improvements are:

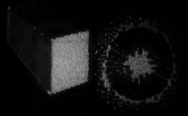
- Many important existing and new routines have been coded in 6502 for the high speed so necessary in graphics applications.
- Improved versions of selected routines such as ?TERMINAL, .S, and many more have been provided.
- *All* known bugs have been fixed.

As Dave & Sandy Small have said, "We plan to write our next game in ValForth."

GENERAL UTILITIES AND VIDEO EDITOR

- Utilities: An extensive package of extremely powerful, convenient routines. The list is too long to detail, but includes: four powerful CASE-type statements; four types of arrays; two "table" words; STICK (in 6502); RND, CHOOSE, and SHUFL random routines; SCRMOVE which allows moving a sequence of screens to a new location on the same or different disk with user verify and prompts; many words supporting string and number input from the keyboard (string handling, too!); SEC and MSEC delays, etc.
- Video Editor: A fast, powerful VIDEO screen editor, like MEMO PAD. (*Does not* use the slow Atari Operating System for displaying screens.) The Editor supports insert and replace modes and has a visible 5 line buffer. Makes editing a pleasure! (Requires ValForth)

PLAYER-MISSILE GRAPHICS, CHARACTER EDITOR, & SOUND EDITOR



With the Player-Missile Graphics package you can create, move position, color and change images of players and missiles at will with fast Forth commands! Automatic or user-controlled memory allocation options. All three widths are allowed and the 5th-player option is completely supported. Features high-level collision checks. Multicolor players are supported and explained, and interfacing with programs is *very* simple. Extensive implementation notes with examples are included.

The Character Editor allows fast composition (using the joystick) of character sets with a simultaneous display of the created characters. Sets may be saved to disk for later recall. It is, also, ideal for composing Player and Missile images.

The Sound Editor allows simple, simultaneous, independent control of all four variables of all four voices possible using one joystick per voice. Any single-setting sound of the Atari can be created with a graphical and a tabular readout. (Requires ValForth)

● ● ●

These are the exact utilities developed by Valpar International's professional software specialists and used to create our commercial software products. *Stay in touch with Valpar!*

DISPLAY FORMATTER

Allows simple generation of any possible combination of screen formats (DISPLAY LISTS). It combines character and graphics modes on one screen in seconds! You can create one display while showing another and modify DISPLAY LISTS at will. There are automatic or user-controlled memory allocation options. Also provided is simple formatting of DISPLAY LISTS for vertical and horizontal fine scrolling, and DISPLAY LIST interrupts, with notes on the implementation of these features. (Requires ValForth)

TURTLE & VALGRAPHICS AND ADVANCED FLOATING POINT ROUTINES

The package includes standard Turtle Graphics as in Atari Pilot. It also has advanced ValForth commands allowing line and point labeling, "turn-toward" and "two-line intersection" functions for vanishing point work, simplified move-and-fill commands, etc. Our Floating Point package expands on the original with: SIN, COS, TAN, ATN, and ATN2, sensible results generated by overflow and underflow, and other features. (Requires ValForth)

Text Compression and Auto Text Formatting

A unique, two-part utility!

- Text Compression allows the packing of text into much less space than normally required. Great for wordy Adventure games, "artificial intelligence," etc.!
- Auto Text Formatting takes both normal and compressed text and routes it to the video screen "windows." User options include: Number of windows (default is 16); window location, height, and width; text colors (for color models); inverse or normal video (for graphics 0 modes); left, right, or center justification; etc. Great for game "control panel readouts," promotional displays, etc.! (Requires ValForth)

ValForth alone requires 24K.
ValForth plus one or more packages requires 32K minimum.

All products are now on non-protected disks.

Over 160 pages of detailed documentation!

ValForth	$39.95
General Utilities and Video Editor	34.95
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Turtle and ValGraphics and Floating Point Routines	34.95
Text Compression and Auto Text Formatting	29.95
Starting Forth (published at $15.95)	13.95
Heavy-Duty Professional Binder (provided free when ordering 3 or more packages)	8.95

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When ValForth and one or more additional packages are purchased and proof of purchase of APX Forth is furnished, a $15.00 credit will be given.

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CIRCLE 252 ON READER SERVICE CARD

ow...dateline:tomorrow...dat

WINCHESTER DISK DRIVE FOR IBM. ONLY $1995! APPLE, ALSO.

David H. Ahl

At the West Coast Computer Faire, Davong Systems, Inc., a company formed in January of this year, introduced one of the most significant products since the beginning of personal computers, a Winchester Disk Drive for the IBM Personal Computer. The drive stores 5 megabytes and can be formatted in a variety of different file structures. It's extremely compact and fits right inside the base of the IBM Personal Computer. Best of all the cost is an unbelievable $1995. This compares to competitive units selling for $3500 and up.

We visited Davong and were very impressed with their operation. Their boards are burned-in in ovens and fully exercised at every stage of the burn-in and quality control procedure. They are a bold company and have ordered enormous quantities of ICs, disk drives, and other products betting that they will be a major supplier in the near future. Of course, this is a chicken and egg situation since buying in high quantities they drive the price down and, hence, can offer the best priced product to the end user. They've also decided to sidestep the middle-man distributor and sell directly to dealers. One can't help but be impressed with a $99 16K Apple memory board and a $1995 Winchester Disk Drive for the IBM Personal Computer.

Soon to be announced: an Apple Winchester Disk Drive similar in capacity to the IBM at a similar price. Packaging is beautiful; it resembles an Apple floppy disk drive with a slightly higher and longer case. To the Apple it simply looks like a very large floppy. Look for it in your computer store.

$1995 TOO MUCH? HOW ABOUT A WINCHESTER KIT FOR $1299?

Just when we thought kits were on their way out, Xebec announced a 5-megabyte Winchester disk system for the Apple II. The $1299 price includes a Seagate drive and Xebec S-140 controller. Yes, it will also be available assembled at a price to be announced.

AMDEK CORPORATION ON THE MOVE

Amdek Corp. (formerly Leedex Corp), well known for its monochrome and color video monitors is branching out into two new product areas. The first is a highly compact three inch floppy disk. This compact package is available in both two and four drive configurations. Cost for a power supply and two drives is $699.

The other new product is a four-color plotter which is said to run at twice the speed of other comparable units. Furthermore, it contains a user changeable ROM chip containing different sets of graphics and alpha-numeric characters at very low cost. Cost for the complete plotter package is projected at $1200-$1300.

VIC 20 IN BAMBERGERS, K-MART, TOYS R US

Amid much local fanfare, Bambergers opened computer departments in their Edison and Paramus, NJ stores featuring the VIC 20, Atari 400 and TI 99/4 computers. A few weeks later Commodore announced that the $299 VIC 20 would also be sold by K-Mart, Toys R Us, selected Montgomery Ward stores and Service Merchandise Co. catalog showrooms.

Creative Computing was involved with the week-long grand opening of the Edison Bambergers computer department. The main problem that we noted is that sales personnel in these types of stores have little knowledge of computers and tend to be apathetic toward learning about them. Furthermore, with scores of demo units all running simultaneously with TV sets instead of monitors, the RF interference was unbelievable with poor picture images the result.

Could be some clouds on the computer mass marketing horizon.

THE TI 99/4A. A MARKET AT LAST?

Texas Instruments feels that the market for home computers is here at last. Sparked by handheld and video games, and a growing awareness of computers, large numbers of consumers are now buying computers solely for home use. TI sees a market of 700,000 to 1 million units for home use in 1982. To help it along, TI has hired 1000 teachers for the summer to conduct "day camp" sessions for a projected 50-70,000 youngsters.

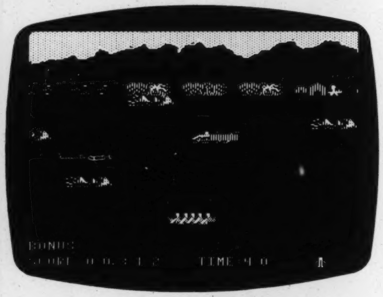
ARCADE GAMES
Apple
David H. Ahl

Congo

The instructions state that, “While you were on safari, you were separated from your native guides. The only way out of the deadly jungle is by making your way down the treacherous Congo River! Along the way you will see other survivors of your party, stranded in native villages or awaiting your rescue on small islands in the river.”

creative computing
SOFTWARE PROFILE

Name: Congo
Type: Arcade game
System: 48K Apple, Disk Drive, Joystick recommended
Format: Disk
Language: Machine language
Summary: Spectacular graphics, clever theme
Price: $34.95
Manufacturer:
Sentient Software, Inc.
P.O. Box 4929
Aspen, CO 81612



“Maneuver your hand-made raft past sharp, jagged rocks, hostile warriors in canoes, powerful hippos and insidious pythons. Beware of the shoreline with its pacing white panthers, snapping crocodiles and dark, tangled vegetation.”

You move your raft by pressing four keys, I for up, K for right, M for down and J for left. Since the river current always carries you from left to right, you cannot move directly up or down but rather move on the diagonal course. We found it took a great deal of frustrating practice to get used to the game. Frequently, we'd pick up a survivor and crash into the island or village where he was standing. Even after picking up a survivor, you must continue to avoid the obstacles in the river while waiting for a calm lagoon in which to dock. All too often, we picked up two or three survivors and then were unable to dock them successfully before the clock ran out. The clock, along with your score and remaining rafts always shows at the bottom of the screen.

I felt a joystick option was mandatory on a game of this type but our pre-production sample did not have it. Imagine my joy when I got a final production disk with a joystick option. Frustration instantly turned to fun. My average score jumped from 0 to 300. We found that switch-or potentiometer-type joysticks worked equally well, and that either was vastly better than the keyboard.

The authors, Michael Berlyn and Harry Wilker have created a spectacular, colorful game with the Apple hi-res graphics. A cute tune signals the demise of your raft and the start of a new round.

Copts and Robbers

Copts and Robbers is a combination adventure/action game. You are in a maze beneath some pyramids. On the wall a sign reads, “Those who came before you to rob me; they all died. You will be trapped here for eternity unless you return the four jewels and the vase to the vault room.”

The player is represented by a small white square which can be moved around using the left and right arrows, and the A and Z keys. The space bar is used to pick up or drop objects while the numbers 0-7 are used to increase or decrease the speed of the game.

Only a small portion of the maze appears on the screen at one time. If you exit to either side or the top or bottom, the adjoining portion of the maze is shown. At the beginner level, the maze is fairly small while at the two advanced levels the mazes are larger.

The game is not an adventure in the sense that you must figure out how different objects are used or solve a mystery. The rules clearly depict all nine objects (coffin, mummies, jewels, ring, vase, killer stone, magnet, key and ghost) and describe what each one is good for or what it will do to you. For example, the ghost likes to pick objects up and move them around the maze, it reincarnates dead mummies and steals objects from you. The ring, on the other hand, chases mummies out of a room.

creative computing

SOFTWARE PROFILE

Name: Copts and Robbers

Type: Action/adventure game

System: 48K Apple, Disk Drive

Format: Disk

Language: Machine language

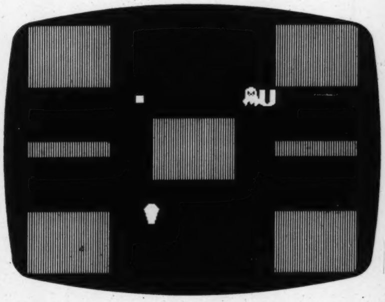
Summary: Engrossing adventure game for children

Price: $34.95

Manufacturer:
Sirius Software
10364 Rockingham Dr.
Sacramento, CA 95827

We found it was difficult to maintain a sense of direction when we first started to play this game. However, as one begins to memorize portions of the maze, it becomes easier to move around. Incidentally, the mazes do not change from game to game.

When starting to play the game, the first object you will want to find is the key. This is necessary to open each of the eight coffins, four of which contain jewels, two of which contain mummies (avoid them if you can!), one of which contains a ring and the last, a killer stone. Ironically, the killer stone is used to kill mummies.



More than a very brief contact with a mummy will kill you. Fortunately, you can then use the "R" key which will reincarnate you as well as all the dead mummies. Objects will still be located where they were when you died but you will be returned to the beginning of the maze. Reincarnation is possible an infinite number of times which was most helpful while we learning the game.

While we are not going to tell you how to win the game, we'll give you one more hint. At higher levels of play the magnet is much more essential than on the beginner level because the ghost puts objects in the wall and the magnet is needed to pull them back out since the player, of course, cannot move through the walls as can the mummies and ghosts.

In summary, the children on our playing panel found this a most engrossing adventure game and kept coming back to try to finish just one more level.

Cyclod

In *Cyclod*, a rather novel game, you have just one mission: to smash snakes. You, the player, are represented on the screen by a small eyeball. With it, you can push one or more bricks around a maze and into the path, or better yet, into the body, of a snake.

At the beginning of this game, the snakes are fairly short and travel slowly. However, as you progress through levels, of which there are more than twenty, the snakes get longer, move faster, and multiply more rapidly.

After you crush one snake, a new one appears immediately, usually across the screen from where you are. We found that on the lower levels, simply going after the snakes and crushing them was a reasonable strategy. However, on the upper levels when more than one snake is on the screen and they move much more rapidly, we found a better strategy was to build snake traps from the blocks or even a fortress for yourself. A real mistake is to push bricks into a corner where you can no longer get behind them and use them for crushing snakes or building barriers.

creative computing

SOFTWARE PROFILE

Name: Cyclod

Type: Arcade game

System: 48K Apple, Disk Drive, Switch-type Joystick recommended

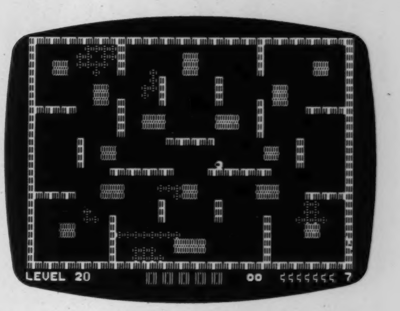
Format: Disk

Language: Machine Language

Summary: Novel theme, highly addictive

Price: $29.95

Manufacturer:
Sirius Software, Inc.
10364 Rockingham Dr.
Sacramento, CA 95827.



We strongly recommend playing this game with a switch-type (Atari) joystick. Although *Cyclod* can be played with a potentiometer type joystick or from the keyboard, we found these modes considerably more difficult at the higher levels of play. Incidentally, we found *Cyclod* would only work with a switch-type joystick through a Sirius Joyport and not an Astar interface. Curious.

In summary, we found this a novel and highly addictive game. It makes excellent use of the Apple color, graphics and sound. *Cyclod* retains the ten highest scores since it was last booted. But, unfortunately, does not retain high scores on the disk.

Dueling Digits

Dueling Digits is a combination arcade/educational game for one or two players. If "arcade" and "educational" sound like a contradiction, read on.

Each player has a scarab-shaped crawler machine which can be directed to move up and down one or the other side of the screen and across half of the bottom. Numbers and mathematical operands (+, −, X, ÷, and =) float about the screen.

When your scarab is at the side of the screen you may shoot one of these numbers or signs. You then carry it to the bottom of the screen where you place it in a balanced mathematical expression, such as 234 + 14 = 248. The computer is not particular about where you leave blank spaces, so it would also accept 2 34 + 1 4 = 248. No operands may be on the right side of the equal sign and the result may not be equal to zero.

In addition to shooting numbers and operands, you may also try to shoot your opponent's scarab at the opposite side of the screen. This can be risky, for a number or operand may drift into your path of fire, and you are then stuck with it. However, if you accidentally pick up a number or operand you do not want you may position yourself above the "garbage hole" toward the bottom center of the screen and press the paddle button to drop the unwanted dgit.

WILL SOMEONE PLEASE TELL

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- IRAP
- Ledger System Business Module
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- Microaccountant Accounting System
- MICROLEDGER
- MJA Multi-Journal Accounting
- Nominal Ledger
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- Paysystem Accountant
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- SBCS General Ledger
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- TCS Accounting
- TCS Client Ledger
- TCS General Ledger
- TCS Total Ledger
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AGRICULTURE

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- Farm Management
- Farrow-To-Finish Swine Production
- Feeder Pig Production
- Fertilizer Formulation
- Field Population
- Field Size
- Finishing Feeder Pigs
- Job Cost (Crop Cost)
- Least Cost Fertilizer Application
- Liming Soil
- Liquid Manure and Fertilizer
- Net Energy for Feedlot Cattle
- PEDIGREE-5 Generation Annotated Pedigree
- Protein Balancing for Feedlot Cattle
- SBCS Agri-Ledger
- Selling Wet Corn vs. Dry
- Sheep Production Economics
- Soil Erosion
- Soybean Harvest Losses
- Swine Ration Analysis
- Swine Ration Formulation

APPLICATION PROGRAM DEVELOPMENT AIDS

- A-FORTH
- ABT Pascal Tools
- APEX-6502 Assembly Language
- Apple-80 Disassembler
- Assembly Language Development System
- AUDEX-Audio Programming Aid
- CBASIC Program Maintenance Utilities
- CINDEX
- Cosapple 1802 Disassembler
- CRTFORM Programmer Productivity
- Diagnostics II
- DISTEL-Disk Based Disassembler
- Executive Planning System
- Floating Point Dictionary
- Forms 2
- Key Perfect-Checksum Table Generator
- Linkdisk-Disk Utility for Apple Pascal
- Linkvideo-Screen Utility
- Lower Case Character Generator
- MULISP/MUSTAR-80
- OGI-Forth-Implementation of FIG-Forth
- Pascal Programmer
- Pascal Level 1
- Pearl III-Rapid Logic Generator
- Personal Programmer
- Prism/Ads Data Base Generator
- Program Development System I
- Program Writer for Non-Programmers
- Programming Aids 3.3
- Quic-N-Easy Application Development
- RAID-Real Time Assembly Debugger
- Scientific Data Base
- SID-Symbolic Instruction Debugger
- Stok Pilot-Menu Generator
- STRING-80
- STRING-BIT
- Systems Analyst
- Teacher Plus Teaching & Reference Pkg
- The BASIC Teacher
- The Last One-Program Generator Pkg
- The Toolbox Programming Utilities
- Tiny-C-Interactive Programming
- UCSD Pascal
- Unlock Development Tool
- V-COM Disassembler Package
- Z8000 Cross Assembler

BUSINESS MANAGEMENT TOOLS

- Analyst-Business Productivity
- Apple Sack General Business Program
- Bookkeeper II-Sales Analysis
- Business Pac 100
- Business Planner
- Creative Financial Package
- Desktop/ Plan
- Execuplan Planning & Forecast
- Financial Modeling System
- Financial Planning Series
- Financial Planning/Analysis
- Finplan/ Financial Planning
- FP2020 Financial Planner
- FPL-Financial Planning Language
- Magic Worksheet
- Magicalc-Forecasting Package
- Micro-DSS/ Finance
- Microfinesse-Financial Modeling
- Milestone-Critical Path Network Analysis
- Optimiser
- PFS-Personal Filing System
- Personal Report System
- Plan 80-Financial Planning & Analysis
- Project Boss-Mgr's Cost Control System
- Project Planning and Budgeting
- Retail Purchasing & Pricing
- Salary Planner
- Senior Analyst
- Supercalc-Electronic Spread-Sheet
- Support Pkg for Real Estate Mgmt
- T/ Maker II-Visual Calculating Tool
- The Analyzer
- The Budget Planner
- Universal Business Machine Planning and Forecasting
- VisiCalc III
- VisiCalc Real Estate Template

CAPITAL PROJECTS PLANNING & CONTROL

- Angle Project Scheduling
- APM-Project Management System
- Jobtrak-Project Tracking
- Milestone Project Management
- Project Management System
- Project Planning

COMMUNICATIONS

- Apple Access III
- BISYNC-80
- BSTAM
- Class Data Recorder
- CM-900 Burroughs Network Services
- Communications Program
- Crosstalk Smart Terminal/ File Transfer
- Data Capture 4.0
- Data Transporter Package
- Datalink
- DTS-3-Serial Data Transfer
- Electronic Mail
- IBM-CP/M Allows Transfer of Data
- IE/ Modem
- Intercom Communications
- METTY-Intelligent Terminal Package
- Micro-Courier
- Micro-Telegram
- Microlink-80-File Transfer Program
- Reformatter-CP/M-IBM Data Transfer
- Remote Console Program
- Smarterm-CP/M Terminal Program
- Term II-Computer Intercommunications
- Term Intercommunications Package
- TTY-Communications With Other Computers
- U-Net-Shared Resources Network
- Ultimate Transfer
- Visiterm-Communications Program
- VT-100 Emulator
- Western Union Interface

DATA MANAGEMENT

- ANALYST
- CBS-Configurable Business System
- CCA Data Mgt System
- CM 2020 Configurable Manager
- Condor Series 20
- Data Managment Program
- Data Manager
- Data Master
- Data-View Electronic Filing Cabinet
- Database II
- Database Management
- Datafax
- Dataflow-Info Processing
- Datastar
- Datastore
- Datatree
- Disk-Edit-Screen Oriented Disk Editor
- DMS-Data Mgmt System
- FABS II-Rapid Keyed Access
- Fast Entry for Tabs Business Modules
- FINDAFYL-Reference Retrieval System
- FMS 80-Data Base Management System
- GBS Database
- General Database
- HDBS-Hierarchial Data Base
- IFO Database Manager
- Information File Organizer
- Information Master-Data Mgmt System
- KTDS-Key to Disk, Data Entry
- Linkindex-Pascal Utility
- MAG/ Base-Data Base Management
- Manager-Relational Data Base
- MDBS.DRS-Micro Database Mgt System
- MUMPS-Language for CP/M Database
- Optimum Data Mgmt Program
- PRISM/IMS-Information Mgt System
- RADAR-Random Access Data Acquisition
- Reprogrammable Data Base
- Scientist-Data Base & Statistical Pkg
- Selector III-Data Base Processor
- Selector IV-Data Base Mgt
- Selector IV-Key Access Info
- Selector V-Data Base Mgmt
- STATPRD-Integrated Database System
- Stoneware Utility Package
- Super Kram II — Multi-Keyed Random Access
- The Reprogrammable Data Base Program
- VisiDex-Data Base Mgt System
- VisiFile-Data Base Mgt Package
- Whatsit?-Conversational Query/ Retrieval

DATA SECURITY SYSTEMS

- Absolute Security
- Encode/ Decode Security System

DISTRIBUTION

- ABT Retail Manager
- Beer Distributor Management
- Inventory, Order Entry, Invoicing
- Oil Jobber Management System
- Order Entry and Inventory Control
- The Store Manager
- Wholesale/ Retail Distribution System

EDUCATION — BUSINESS

- Accounting Tutor
- Comparative Buying
- Income Meets Expenses
- Interactive Typing Tutor
- Job Readiness-Assessment & Development
- Mastertype-Typing Instruction
- Money Mgmt Assessment
- Typing
- Typing Tutor
- You Can Bank On It-Bank Concepts

EDUCATION — CHEM/ PHYSICS

- Acid-Based Chemistry
- Atomic Structure
- Chem Lab Simulation
- Chemical Equilibrium
- Chemistry With A Computer
- Fundamental Skills for General Chemistry
- High School Chemistry
- High School/ Jr. College C.A.I. Biology
- High School/ Jr. College C.A.I. Physics
- Organic Nomenclature
- Physics

EDUCATION — ENGLISH

- A Batch of Endings
- Agreement of Pronoun/ Antecedent
- Alphabetize
- Capitalization
- Catalog Cards
- Commas
- Compu-Read
- Compu-Spell
- Coordination
- End Marks
- Excess Words
- Faulty Coordination
- Hearing the Homonyms
- Irregular Verbs
- Is It "ie or ei?"
- Language Drill
- Locate Books on the Shelf
- Magic Spells
- Misplaced Modifiers
- Parallel Structure
- Possessing the Possessives
- Prefixes & Suffixes
- Quotations
- Reading Level
- Readings In Literature
- Run On Sentences
- Scramble
- Sentence Diagramming
- Sentence Fragments
- Speedreader
- Spell-N-Time
- Spelling Bee with Reading Primer
- Spelling Those Plurals
- Still More Nasty Demons
- Subject/ Verb Agreement
- Subordination
- The End of the Endings
- Those Nasty Demons
- Understand the Card Catalog
- Understand the Title Page
- Use an Index
- Use the Table of Contents
- Using Adjectives/ Adverbs Correctly
- Word Scrambler & Super Speller

EDUCATION — MATH

- Addition & Subtraction
- Algebra I
- Basic Math Skills
- Compu Math: Arithmetic Skills
- Compu-Math Decimals
- Compu-Math Fractions
- Counting Bee
- Decimal Estimation
- Division Drill
- Drill II
- Elementary Math
- Fractions
- Geometry
- Geometry and Measurement Drill
- Lessons in Algebra
- Matching and Using Numbers
- Matching Geometric Figures
- Math-Addition & Subtraction
- Matrix Mathematics Package
- Measurements
- Multiplication & Division
- Mumath-PO Symbolic Math
- New Subtraction
- Numerical Analysis Mathematics
- Problem Solving
- Problem Solving in Everyday Math
- Sets
- Sign Drill/ Typing
- Statistical Analysis I Mathematics
- Statistics 3.0
- Typing Fractions

EDUCATION — MISC.

- 2ES Courseware
- American History Through Biographies
- American Indians
- Antonyms
- Apple Sack 2 Home Education
- Approximate Measure
- Astronomy I & II
- Concentration-Taxing
- Counting Calories
- Early Civilization
- Educational Package
- Educator's Disk
- Family Fun
- Farm and Farm Products
- HI-Res Life
- History
- Home Safe Home
- Insects
- Light Pen Quiz
- Literature
- Living Things
- Math, Sports, Etc.
- Middle Ages
- Money
- Moptown
- Mother Goose Rhymes
- Music/Art
- Our Bodies
- Poison Proof Your Home
- Questions & Answers in Biology
- Questions & Answers in History
- Quizstat
- Reverse/ Sampling
- School Days
- Sentence Beginning
- Shore Features
- Sound
- Supermap
- Synonyms
- Systems of the Body
- Teacher Create Series
- Teacher Plus
- Telling Time
- The Basic Teacher Pac
- The Earth and It's Composition
- The Professional-Teaching Program
- The Solar System
- Transportation History
- Typing
- United States
- Visual Perception Tests
- Weather Fronts
- Work Relationships
- World Desert Region
- World Polar Regions

FINANCE-INVESTMENT & PORTFOLIO ANALYSIS

- Analysis 1-Stock Trend Data Analysis
- Commoapx System
- Computicker
- Computrac File Reader
- Dow Jones News & Quotes Reporter
- Dow Jones Portfolio Evaluator
- Dowlog-MC
- Electronic Stock Package
- Engineer's System For Trading
- Forecast I
- Forecast II
- Fotofolio-Visual Display w/ Statistics
- Gann's Square of Nine Analysis
- Intelligent Investor
- Investment Analysis
- Market Charter-Technical Analysis
- Moneybee-Investment Analyst
- Options 80-Stock Options Analyzer
- Portfolio Master
- Quotecharter
- Quoteprocessor
- Ratortn-Investment Analysis
- Stock and Options Analysis
- Stock Forecasting
- Stock Market Management
- Stock Market Utility
- Stock Option Analysis
- Stock Tracker
- Stock Valuation Program
- Stocksheets
- Strategy M-Monitor Price Change Dynamics
- The Clover Method Trading System
- The Stock Portfolio Program
- Tickertec-Tickertape Program
- Wilers 6 Systems Analysis

FOREIGN LANGUAGES

- Chinese Lessons
- Foreign Words and Phrases
- Greek Roots and Prefixes
- Japanese Lessons
- Latin Roots and Prefixes
- The French Hangman
- The Russian Disk
- The Spanish Hangman

GAMES

- Adventures
- Alien Rain
- Alien Typhoon
- Almanac — The Time Machine
- Amaze
- Analiza
- Animal
- Anti-Ballistic Missile
- Apple Adventure
- Apple Bowl
- Apple Fun
- Apple Panic
- Apple Sack 3 — Adventure Pak
- Apple Sack 7 — Space Sack
- Apple Sack 8 — Game Sack
- Apple Sack 9 — Base Star
- Apple Stellar Invaders
- Apple-oids
- Asteron
- Astro-Scope
- Astrology
- Autobahn
- Backgammon 20
- Battle of Midway
- Beer Run
- Best of Muse
- Biorythms
- Blackjack
- Both Barrels
- Brands
- Bridge 2.0
- Bridge Tutor
- Bubbles, Planetoids and Burnout
- Cartels and Cutthroats
- Castle Wolfenstein
- Chambers of Xenobia
- Chebychev 1
- Chebychev 2
- Chronicles of Osgroth
- Civil War
- Compu-Math Arithmetic
- Compu-Math Decimals
- Compu-Math Fractions
- Computer Air Combat
- Computer Baseball
- Computer Bismark
- Computer Conflict
- Computer Napoleonics
- Computer Quarterback
- Cops and Robbers
- Cosmo Mission
- County Carnival
- Cyber Strike
- Disk Talker
- Dr. Chips
- Dragon Fire
- Dungeon
- Executive Fitness
- Falcons
- Fantasyland 2041
- Fastgammon
- Flight Simulator
- Galactic Attack
- Galactic Wars
- Galaxy Wars
- Games People Play
- Gamma Goblins
- Gobbler
- Golf/ Cross-Out
- Gorgon
- Hammurabi
- Head On Game
- Hellfire Warrior
- Hi-Res Football
- Hi-Res Soccer
- In The Army Now
- Into Ships
- Jet Fighter Pilot
- Klondike 2000
- Lost By Ship
- Mastermind
- Meteoroids in Space
- Micro Othello
- Mimic
- Mind Games Package
- Mission Asteroids
- Mystery House
- Need an Analyst
- Nominoes Jigsaw
- Oil Tycoon
- Olympic Decathlon
- Operation Apocalypse
- Orbitron
- Outpost
- Paddle Fun
- Pegasus II
- Perception 3.0
- Phantoms Five
- Planetoids
- Plot 3D
- Pokeno
- Poker Slot Machine
- Pool 1.5
- Pot 'O Gold I
- Pot 'O Gold II
- President Elect
- Pro Football
- Pro Picks
- Project Omega
- Pulsar II
- Race For Midnight
- Raster Blaster
- Red Baron
- Rendezvous
- Robot Wars
- Sahara Warriors
- Sargon II (Chess)
- Satellite Trak
- Shell Games
- Shuffleboard
- Skybombers
- Skybombers II
- Sneakers
- Snoggle
- Soft Porn
- Softside Publications
- Space Eggs
- Space Warrior
- Spellguard
- Spelling Bee
- Star Cruiser
- Star Dance
- Star Thief
- Startraders
- Startrek
- Stock
- Sub Attack
- Tawala's Last Redoubt
- Teacher's Pet
- Temple of Apshal
- Terrorist
- Tetrad
- The Strip
- The Asteroid Field
- The Great Escape
- The Horse Selector II
- The Prisoner
- The Scorekeeper
- The Shattered Alliance
- The Warp Factor
- Three Mile Island
- Torpedo Fire
- Ultima
- Voyage of the Valkyrie
- War and Games
- War Games
- Warp Factor
- Watch Your Moves
- Win at the Races
- World's Greatest Blackjack
- Wumpus
- Xplode

ME WHAT AN APPLE CAN DO?

GRAPHICS/ COMPUTER-AIDED DESIGN

3-D Surface Plotter Package
A2-3D1 Graphics Family
ABT Barwand Software
Action Sounds & Hi-Res Scrolling
Apple Plot
AppleGraphics II
Artist Designer
Bar Chart (Histogram) Graphics
Business Graphics III
Circuit Designer Graphics
Circuit Simulator
Creativity Tool Box
CURVFIT
Data Plot
E-Z DRAW
FLGDZINE
Graforth — Development Tool
Graph Fit
Graph-Pak
GRAPHPOWER
Hi-Res Secrets
Line Graphics
MC Painting
ORIFICE
Pascal Animation Tools
Pascal Graphics Editor
Perspective Plot — 3-D Graphics
PGE — Graphics Editing Package
Pilot Animation Toolkit
Polar Coordinate Plot
RGL Real Time Graphic System
Screen Director
Shape Table Generator
Stats-graph
Super Shape Draw & Animate
Tablet Graphics
The Coloring Board Program
The Designer
Topographic Mapping
Ultra Plot
Utopia Graphics Tablet System
VACVESL — Vacuum Vessel Design
VESDZINE — Design of Vessels
VISITREND/VISIPLOT
X-Y Vector Plot Package

HOME MANAGEMENT

Address File
Auto Records
Checkbook Balancing
Checking Account Management
Chequemate
Diet Analysis
Financial Analyzer
Five Minute Financial Check-Up
Grocery List
Home Finance
Home Inventory File
Home Money Minder
Home Purchase Analysis
Magazine File
Mortgage Analysis
Personal Accounting System I
Personal Expense Record
Personal Finance Manager
Personal Financial Planning
Programmed Exercise
The Personal Check Manager

INCOME TAX

Dow Jones Portfolio Evaluator
Individual Tax Planner
Micro-Tax Individual Tax Package
Micro-Tax Integrated State Income Tax
Micro-Tax Partnership Package
SHORTAX — Tax Planning Package
Tax Planner
Tax Preparer
TRPS — Tax Return Preparation System

INVENTORY CONTROL

ARM-1000 — Rental Business
Basic Business Inventory
Bill of Materials
BPI Inventory Control
Infotory Inventory System
Inventory Accounting
Inventory Control
Inventory Management
Inventory Management for Stock Control
Inventory Pac
Inventory System Business Module
Manufacturing Inventory Control
MATSTAT-Materials Tracking
Order Entry/Inventory Control
Peachtree Inventory System
Point-Of-Sale Retail System
Property Manager for Moveable Equipment
Retail Inventory
Rogis Stock Control for Components
Stock Control
Stock Recording
Stockfile Inventory System
Stockroom Inventory and Purchasing
Structured Systems Inventory Control
TCS Inventory Management
The Order Scheduler

JOB & CONTRACT COST ACCOUNTING

Billflow
Bookkeeper II-Job Costing
BPI Job Costing
Contract Billing
Contractor Job Cost
Cost Accountant
Job Accounting System
Job Control System
Job Cost Accounting
Project Cost Accounting for Architects
Project Cost Accounting for Engineers
The Software Fitness Job Cost Analyst
Time Recording-Job Cost Analyst
Timerec-Transaction Carry Forward

MAILING LIST & LABEL PROCESSING

Address Book Mailing List
Apple III Mail List Manager
Apple Mail Sack
Apple Post
Benchmark Mail List
Commercial Mailer
Mail List
Mail80 Mailing List Software
MAILER-Name & Address Management System
Mailing Address
Mailing List Package
Mailing System
MAILMERGE
MAILPRO
Mailroom-Mailing List Management
Master Mailing List
NAD-Name & Address Selection System
Name And Address
Postmaster-Mail Management
Professional Mailout
School Mailer
Small Business Mailing & Filing
Super-M-List Mailing List Program
Ultra Plot/Mailing & Filing System I

MARKETING/SALES ANALYSIS

EASYTRAK-Salesmen Monitoring Package
Marketing Systems — Proposal Developer
Office and Agent Productivity Package
Sales Analysis
Sales Pro Prospect Mgt Package
Sales Tracker
SALESLOG — Sales Mgt Program
SNAP — Questionnaire Design and Printing
TCD Life Insurance Computer System

MISCELLANEOUS

BILL — Building Energy Use
Circuit Analysis
Hand Holding Basic
Insulate
Mini-Warehouse System
Stepwise Multiple Regression

MUSIC

Alpha Syntauri Music Synthesizer
Apple Music Theory
Apple Sack Music & Graphics
Appleodion Music Synthesis System
Music System
Musicomp
The Electric Duet

ORDER ENTRY/ ACCOUNTS RECEIVABLE

BPI Accounts Receivable Program
Cash Receipts System
Company Sales
Invoice Compiler
Invoicing
Membership Billing
MICROREC
Multi-Property Accounts Receivable
Open Item Accounts Receivable
Order Entry
Order Entry and Billing
Order Entry and Invoicing
Order Tracking System
Peachtree Accounts Receivable
Peachtree Sales Invoicing
Progressive Billing
Purchase Order System
Receivables System Business Module
Receiver
Sales Invoicing
Sales Ledger
Sales Order Processing
Software Fitness Program — A/R System
Structured Systems Accounts Receivable
T-SOP Sales Order Processing
TCS Accounts Receivable Package
TCS Total Receivables
The Biller

PAYROLL PROCESSING

Advanced Payroll Package
After-The-Fact-Payroll — updates records
Apple Payroll System
Bookkeeper II-Payroll
BPI Payroll
Business Basic Payroll System
Contractor Payroll
Jobcost Payroll
Micropayroll
Passive Payroll
Paymaster
Paymaster-Payroll System
Payrecord I
Payroll
Payroll Accounting Package
Payroll Assistant
Payroll I
PeachPay
Piece Rate Payroll System
Post Facto Payroll
Print/Paycheck Accounting System
Run Time Payroll Program
Sheltered Workshop Reporting
Structured Systems Group Payroll
TCS Payroll Package
TCS Total Payroll
Variable Worker's Compensation
WH-347-Accessory program for Jobcost

PERSONNEL MANAGEMENT

AMI Post-Facto Payroll
MICROPERS — Payroll & Personnel Mgmt
Personnel Data Recorder
Personnel Office — Federal Compliance
Personnel Record
Personnel Record/Employee Records System

PROFESSIONAL OFFICE SYSTEMS

AMI Omegabyte Time & Billing
BETA — Stand Alone Time & Billing System
Billkeeper — Professional Billing
Client Billing System
Client Record/Bill Preparation
Datalaw System 3-Law Office Mgmt
DataTime
Dental 80A-Dental Accting & Billing
Dental Billing Package
Dental Office Management
DentalEase
Dentistaid — Dentist Office Management
Insyst (Insurance System)
Legal Billing & Timekeeping System
Legal Clerk — Office Management System
Legal Time Accounting System
Medicaid Day Treatment
Medical Accounting and Billing
Medical Clinic
Medical II — Office Mgmt System
Medical Office Management
Medical Secretary
Medical/Dental Management System
Medical/Manager
MedicalEase
MedPak
Medtips — Billing & Insurance Forms
PAS — 3-Patient Billing & Accts Receivable
Patient Accounting System
PIP-Payroll/Invoicing Program
Professional Office Management
Professional Time & Billing
PTA — Professional Time Accounting Pkg
Series 8000 Dental Mgmt
Series 8000 Medical Mgmt
Series 9000 Family Dental Management
The Patient Scheduler
Timeclok
Timemaster — Time Accounting
Timesaver Client Billing System

PROGRAMMING LANGUAGES

Ada Compiler
APL/V80 Language
Apple III Business Basic
Apple III Pascal
Apple FORTRAN
Apple Logo
Apple Pilot
ASM 65-Assembler
BASIC A+ — Extended Business Basic
BASIC Compiler
BASIC-80
BASIC/Z — Native Code Compiler
BD Software "C" Compiler
C Compiler
CBASIC 2 Compiler
CIS COBOL
COBOL 80
Cos Assembler
Cos COBOL
Focal 65-High Level Programming
Forth 86
Forth-Language Compiler
FORTRAN 80
FORTRAN IV
Hand Holding BASIC
KBASIC — Microsoft Disk Extended BASIC
Language System with Apple Pascal
LISP-80 Compiler
MAC 8080 Macro Assembler
Mulisp Compiler
MULISP/MUSTAR 80
muMath/muSimp 80-High Level Programming
Nevada COBOL Compiler
Pascal Compiler
Pascal/M86
Pascal/MY+With SPP-ISO Standard
PL/1-80-Programming Language
RATFOR — FORTRAN Language
S-Basic
SSS FORTRAN Compiler
Softronics
Stiff Upper Lisp
TCL Disk BASIC Interpreter
TCL-Pascal
TEC 65-Editing Language
Tiny BASIC High-Level Language
Tiny C
Tiny Pascal
Tiny-C-Two Compiler
Transforth II
UCSD Pascal
Whitesmith's Compiler
XPLO-Structured Language
XY BASIC Interactive Process Control

PROGRAMMING UTILITIES

Apple Sak 4 — Utility Package
Basic Utility Disk
Disk Utilities 3
Disk Utility Package
Disk-o-Tape-Pascal
DOS Tool Kit
File Maintenance Package
MAG/Sam Keyed File Mgmt System
MAG/Sort-Record sort
Masterdisk-disk Sector Editor
MSORT — for COBOL 80
Pascal Utility Library
Pascal — Sort Program
PSORT — Pascal File Sorting
QSORT — Sort/Merge Program
SORT/B — Hybrid Sort
Supersort
Ultrasort

PURCHASING/ACCOUNTS PAYABLE

Accounting Payable
Accounts Payable Business Module
Accounts Payable/Purchase Order
Bookkeeper II — Accounts Payable
Cash Disbursements Posting System
Check Writer
Company Purchases
Contractor Accounts Payable
Disk-O-Check
Micropay-Accounts Payable
Print Check Accounting System
Purchase Ledger
Structured Systems Group Accts Payable
T-POP — Purchase Order Processing

REAL ESTATE

American Software Property Management
Apartment Building Investment Analysis
Apartment Manager
Commercial Property System
Construction Cost/Profit Analysis
Cornwall Apartment Management
Income Property Analysis
Listings
Multi-Property Accounting System
Office/Apartment Real Estate Management
Property Analysis System
Property Management
Property Management System
Property Mgmt — G/L Tenant and Expenses
Real Estate Analysis Program
Real Estate Analyzer
Realty Package
Rent vs. Buy
Rental Manager
Residential Property Management
Tax Deferred Exchange Model
Tenant Processing Package
The Landlord-Property Mgmt System
VisiCalc Real Estate Templates

TIME MANAGEMENT & SCHEDULING

Agenda Files
APM — Project Scheduling
Appointment Calendar
Color Calendar Package
Datebook Appointment Calendar
DATEBOOK Time management System
GUARDIAN — Computerized Scheduling
Office Manager — Staff Appointments
Personal Datebook
Professional Secretary
PROSCHED — Project Schedule
Time Manager

WORD PROCESSING

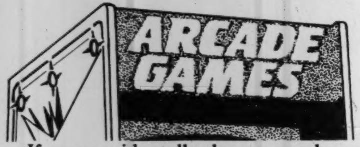
Apple World Oriented Text Editor
Apple Writer II
Apple Writer III
Benchmark — Word Processing System
Docuwriter Text Processor
Easywriter Word Processing
EDITRIX 1.0 — Word Processing
Form Letter Module
Formulex — Business Form Design
Goodspell
Letter Master — Basic Word Processor
Letteright Correspondence Processing
Letterite Word Processing System
Magic Spell — 20,000 Word Dictionary
Magic Wand — Phrase Insertion
Magic Wand — Word Processor
Magic Wand Word Processing System
Magic Window Word Processor
MAIL-MERGE-Wordstar Enhancement
Manuscripter — Word Processor
Master Text Processor
Memorite III Word Processing
Microspell Spelling Corrector
PALANTIR — Word Processing and Accounting
Personal Text Processing
Report Writer — Word Processing
Script III
Secretary — Word Processing
Spellbinder Word Processing
Spellguard
Super-Text Word Processing
Supertext II
TEXTWRITER III — Text Formatting Program
The Word Spelling Checker
VTS-80 CP/M Word Processing
WordIndex
Wordmaster — Comprehensive Editor
WORDMASTER Text Editor
Wordstar — Word Processing

With these and thousands of other ready-to-use programs to choose from, including the vast array of CP/M® software, you can do more things with an Apple® than any other computer you can buy. So over 1200 Apple dealers have a question for you:
What do you want it to do?

apple® The personal computer.

Call **800-538-9696** for the location of the authorized Apple dealer nearest you, or for information on our new National Accounts Program. In California, (800) 662-9238. Or write: Apple Computer Inc., Advertising and Promotion Dept., 20525 Mariani Ave., Cupertino, CA 95014. Software products listings courtesy of SOFSEARCH™ Call toll-free 800-531-5955, (in Texas, call 512-340-8735).

CIRCLE 109 ON READER SERVICE CARD



If you accidentally drop a number or operand in the wrong place so that your expression shows little chance of balancing, you can move your scarab to the bottom center of the screen and press the paddle button. This will release all of your numbers and allow you to start over.

creative computing

SOFTWARE PROFILE

Name: Dueling Digits

Type: Educational/arcade game

System: 48K Apple, Disk Drive, Paddles or Joystick

Format: Machine language

Summary: Stimulating action coupled with excellent educational value.

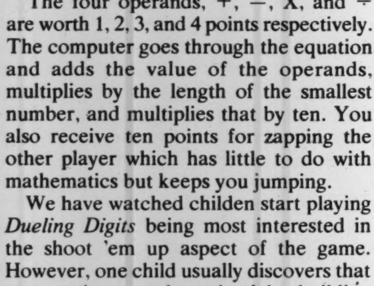
Price: $29.95

Manufacturer:
Broderbund Software
1938 4th St.
San Rafael, CA 94901

The four operands, +, −, X, and ÷ are worth 1, 2, 3, and 4 points respectively. The computer goes through the equation and adds the value of the operands, multiplies by the length of the smallest number, and multiplies that by ten. You also receive ten points for zapping the other player which has little to do with mathematics but keeps you jumping.

We have watched childen start playing *Dueling Digits* being most interested in the shoot 'em up aspect of the game. However, one child usually discovers that more points can be gained by building mathematical expressions. The emphasis then shifts and we found children making pacts not to shoot each other so they could amass huge scores. One such marathon game went on for well over an hour.

Incidentally, when only one player is playing, the computer becomes the opponent. The computer does not attempt to form mathematical equations but simply tries to blast the player's scarab out of existence. By concentratng on building mathematical expressions and keeping out of the way of the computer scarab shots (but taking advantage of an occasional zap at the computer) we found we could usually beat him at his own game.



In summary, we found *Dueling Digits* to be a most engaging game with good action and sound. In addition, the educational value is excellent, largely because of the high motivation provided by the game elements.

Escape!

In the early 1970s, one of the most prolific game writers around was Mac Oglesby of Putnam, VT. Most of his games were written on an ASR-33 terminal connected to the Dartmouth timesharing system. His games were published by both *People's Computer Company* (a tabloid newspaper) and by *Creative Computing*. One of Mac's more popular games was called *Chase*. It was originally published in *Creative Computing*, Jan/Feb 1976 and again in the book *More Basic Computer Games*. Over the years, other versons of Chase have appeared under names such as Twonky and Escape. Now we have yet another version for the Apple which adds delightful, colorful graphics and sound, but basically this is Mac's game.

creative computing

SOFTWARE PROFILE

Name: Escape!

Type: Strategy game

System: 48K Apple, Disk Drive

Format: Disk

Language: Basic?

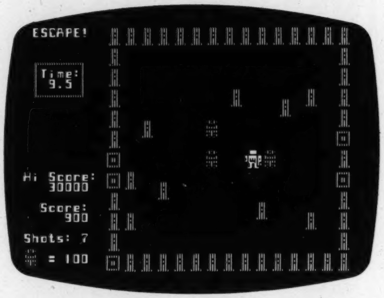
Summary: Update of an old favorite

Price: $29.95

Manufacturer:
subLogic
201 West Springfield Ave.
Champaign, IL 61820

Escape! is a game of strategy and logic. You are located within the walls of a prison and must get from one level to another using one of several transportation pads which are found around the perimeter of the prison (screen). Comprising the perimeter of the prison and scattered throughout the prison yard are electrified posts which must be avoided. In addition, electronic robot security guards pursue you relentlessly. On any move, you may move in one of eight directions or stand still. After you move, the guards move.

Guards may be destroyed in three ways: causing them to run into one another, causing them to run into a high voltage post or zapping them with your laser. Guards destroyed in either of the first two ways add points to your total score while guards destroyed with your laser do not.



The rules tell us, "As you progress, you will begin to develop the evasive tactics necessary to avoid capture. Eventually you will develop strategies enabling you to use each guard's mindless pursuit to your own advantage. Acquisition of these skills will greatly enhance your score in the later stages of the game."

In early stages of the game, you have ten seconds to decide on a move, whereas in later stages, you have less and less time. Also, in later stages there are fewer electrified posts into which you can maneuver your electronic pursuers.

This game was fun when played on a Teletype. The addition of color, graphics and sound of the Apple enhance its play value even further.

Gold Rush

In this game, a train chugs into a station on the center right side of the screen. A prospector (you) gets off and from there on, it is up to you to make your fortune in a wild west gold town.

Scattered throughout the countryside are bundles of TNT. You stake a claim by picking up a bundle of TNT and placing it in one of the four mines in the left side of the screen on top of an ore cart. In moving around the town and adjoining countryside, you must avoid the Indians,

creative computing

SOFTWARE PROFILE

Name: Gold Rush

Type: Action game

System: 48K Apple, Disk Drive, Joystick recommended

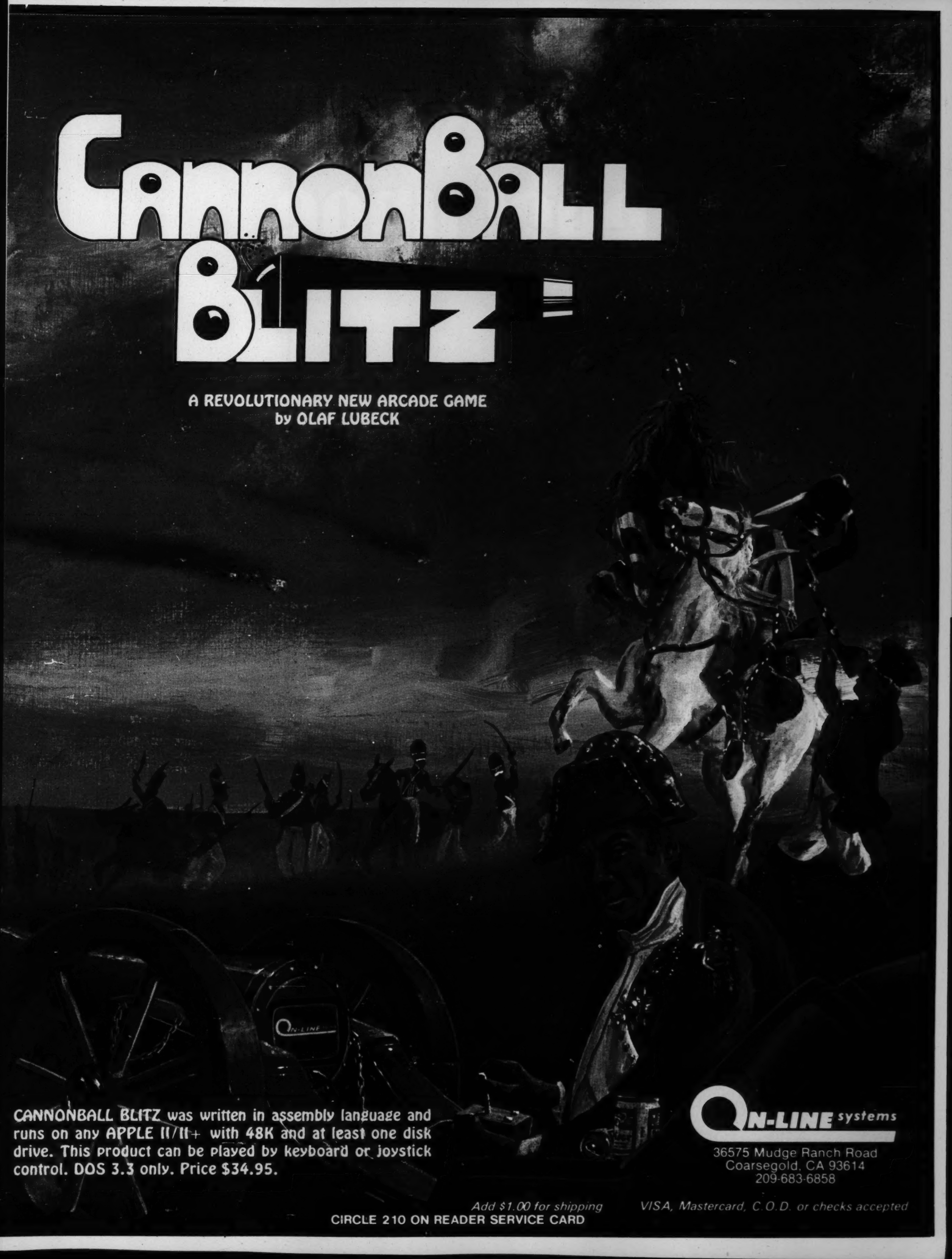
Format: Disk

Language: Machine language

Summary: Fast-paced, challenging and fun

Price: $34.95

Manufacturer:
Sentient Software, Inc.
P.O. Box 4929
Aspen, CO 81612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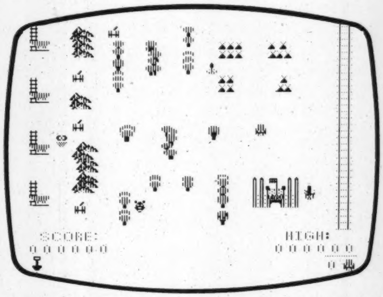
ARCADE GAMES

cavalry and bears. There is also a claim jumper who will leave you alone if you aren't carrying any TNT, but if you are carrying it and run into the claim jumper, he will steal the TNT and place it back in its original spot.

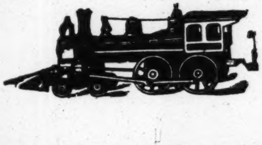
You must also watch for bonus objects (shovel, pick, hammer, and scales) which appear in the Indian village. If you pick up one of these objects and then stake a claim, you will receive an appropriate bonus between 100 and 350 points. Each claim that you stake without a bonus object is worth 400 points. There are also three mystery bonus objects which are worth various numbers of bonus points.

After successfully staking eight claims (two screens), you are entitled to a bonus round. You get 60 seconds to work four mines while avoiding the three insane claim jumpers. If you succeed, you are awarded an extra man.



The game may be played from either the keyboard or with a joystick. From the keyboard the I, J, K and M keys are used to move up, down, right and left. We found the game considerably easier to play using a switch-type joystick with self-centering. In playing the game we found the bears were the most difficult to avoid while the Indian was the easiest to avoid except when you entered the Indian village to pick up a bonus object. Since the TNT is randomly located on each play of the game, it was not possible to work out successful patterns of play as one might do in Pac-Man. Rather, the game puts a higher premium on quick response and avoidance maneuvers. Some players were initially frustrated with the game until they got the hang of this method of play.

The game makes excellent use of color, graphics and sound of the Apple and it is one that can be enjoyed by players of all ages. As mentioned above, we strongly recommend, a self-centering, switch-type joystick for most enjoyable play.



The Human Fly

The instructions tell us that "*Human Fly* will test your skill as you attempt to climb the CPU Towers Building. As you climb, you must avoid all the hazards that accompany such a dangerous task. You will be confronted with angry police, unpredictable birds, falling flower pots, closing windows, earthquakes, menacing gorillas, and an occasional rising balloon (catch it and gain ten floors).

"If you fall, you will fall 20 floors before you are able to catch a ledge. You will be allowed to fall a total of three times, provided you are above the 19th floor."

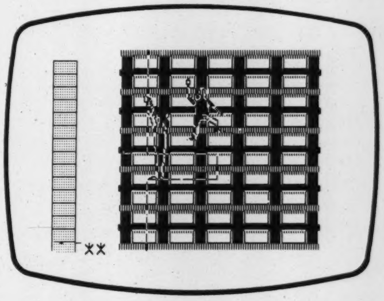
creative computing
SOFTWARE PROFILE

Name: The Human Fly
Type: Arcade game
System: 48K Apple, Disk Drive
Format: Disk
Language: Machine Language
Summary: Apple version of Crazy Climber
Price: $29.95
Manufacturer:
Computer Programs Unlimited
9710 24th Ave. St. S.E.
Everett, WA 98204

The Human Fly is represented by a stick figure on a building which shows five floors at a time. When you reach the top of the five floors the next five come into view and you start again at the botom.

The Human Fly is "moved" from the keyboard; the letters W and I raise the left and right arms respectively. Alternating A with Space Bar and L with Space Bar moves the fly left or right respectively. The Space Bar returns the arms to the stable position which must be done quickly in the event of an earthquake.

Needless to say, the author, Kevin Bagley, has modeled this program on the arcade game, Crazy Climber. There are, of course, some differences but we can reasonably predict that if you like Crazy Climber, you will like the *Human Fly*. Incidentally, when he falls, a perspective drawing of a building and street is shown with the *Human Fly* falling head over heels and eventually splattering on the pavement in a bloody heap, a somewhat gory but spectacular end to the climb. A rating of your climbing ability is also given at the end of each game.



Juggler

We read in the rules that "*Juggler* is an exciting, fast action game, in which you try to accumulate a high score by juggling various types of objects. You are given three jugglers for each game and one extra juggler may be earned by reaching 100,000 points."

On the left side of the screen is a launcher similar to a pinball plunger. It launches balls and other "tumblers" into the air where they careen off a small inclined plane and hit objects the juggler is tossing into the air or the juggler himself.

In the beginning, the juggler has large objects, pizza pans perhaps. But as the game progresses the juggler's objects get smaller and smaller and don't go as high, thus it becomes more difficult to keep the tumblers in the air.

There is a chute at the left side of the screen. If an object enters this chute it is launched out of the bottom at high velocity back up into the fray. Eventually, when tumblers are collected on a maze of shelves at the left side of the screen next to the launcher, they work their way down to the bottom where they are again launched. After the player has successfully kept all the tumblers in the air for 90 seconds the screen flashes signalling that a new level has been reached and the action continues.

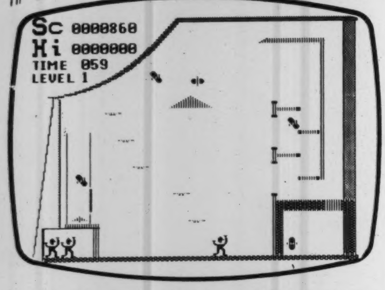
creative computing
SOFTWARE PROFILE

Name: Juggler
Type: Arcade game
System: 48K Apple, Disk Drive, Paddle optional
Format: Disk
Language: Machine Language
Summary: Unique and very delightful
Price: $29.95
Manufacturer:
IDSI
P.O. Box 1658
Las Cruces, NM 88004

Juggler can be played from either the keyboard or paddle (or joystick). From the keyboard, *Juggler* can be played in "auto-toss" mode. This means that the objects used to help the juggler keep the tumblers from hitting the ground are constantly tossed in the air. Alternatively, the objects may be tossed manually by pressing the paddle button or any key.

There are seven levels of play in *Juggler*. The number of points you obtain per hit

ARCADE GAMES



is based on the level at which you are playing. Each hit scores at 30 times the level. Bonus points are obtained when the tumblers are forced into the maze at the right or the chute at the left. An extra 500 points is obtained whenever the juggler, himself, hits a tumbler.

All the members of our playing panel found the game absolutely delightful and unlike anything else currently on the market.

Labyrinth

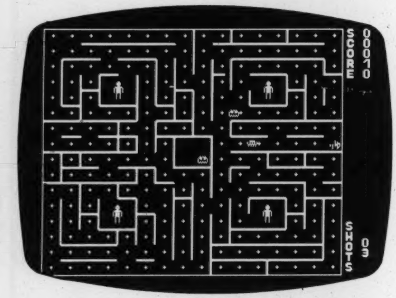
Labyrinth is a addictive maze-type game which is best described by the instructions. "You are represented on the screen by a blue, diamond-shaped object. Your movement is controlled by four keys, I for up, J for left, etc. You are armed with a trapper-zapper which you can shoot in four directions using E to fire upward, S for left, etc. Your object is to rescue the four men contained inside four boxes scattered about the screen. Once you have freed all four men, an X will appear in the opposite corner from which the last man was freed which you must reach in order to advance to the next level.

"The difficulty with all of this lies in the fact that the walls to the Labyrinth are moving, with doors opening and closing all the time. You can shoot your way through a wall if you want to, with the exception of the box walls which contain the four prisoners and the box in the middle. Out of this central box will spring a wide variety of creatures such as trappers, scourges, and maybe even a minotaur or two. These creatures can destroy you by touching you or by zapping you with bubble-like projectiles which emanate from their horrifying orifices."

creative computing
SOFTWARE PROFILE

Name: Labyrinth
Type: Arcade game
System: 48K Apple, Disk Drive
Format: Disk
Language: Machine language
Summary: Addictive maze game
Price: $29.95
Manufacturer:
Broderbund Software Inc.
1938 4th St.
San Rafael, CA 94901

Each time you hit one of the monsters, you receive two extra zappers. If you are out of shots, you can earn an extra zapper by freeing one of the men from his cage. There are eight different levels of increasing difficulty, although frankly we never got to see the highest levels in our play of the game.



Some of the members of our playing panel liked to free all of the prisoners first and then head for the X as fast as possible. Others elected to hide at the end of short maze trails and wait for monsters to come by so they could zap them and build up their zapper credit.

On the other hand, it is dangerous to sit in one place for too long a time because the baddies know you are there and eventually come and get you.

We found that when more than seven baddies were roaming around the screen it was almost impossible to move without being zapped. An unfortunate thing that the rules don't tell you: the shots fired by the monsters travel slightly faster than yours do, so if you both fire at once, you are the one who dies.

The disk stores the top ten scores with the initials of the player, a feature which we have admired in Big Five Software for some time, but haven't found in most Apple games.

We found the game most entertaining and addictive; our applause to Scott Schram, the author.

Micro Golf

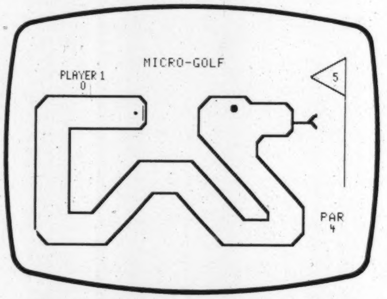
In *Micro Golf*, one to four players try to hit a ball into holes on a miniature golf course. Three different courses are provided on the disk, and the user may modify any one of them or create an entirely new one. The game may be played using either paddles or the keyboard, however, we found the paddles easier to use and seemingly more precise.

creative computing
SOFTWARE PROFILE

Name: Micro Golf
Type: Strategy/action
System: 48K Apple, Disk Drive, Paddles recommended
Format: Disk
Language: Machine Language
Summary: Enjoyed by non-game players
Price: $19.95
Manufacturer:
Creative Computing Software
39 E. Hanover Ave.
Morris Plains, NJ 07950.

The pattern for each hole is loaded individually from disk. While it is loading, the score card to that point of play is shown. The score card contains the par for each hole and the scores for the up to four players on the holes that have been played so far.

When the diagram of each hole appears, the small white circle, appropriately enough, is your ball while the larger white circle is the hole. Your putter appears next to the ball. Paddle 0 controls the direction that the putter faces and Paddle 1 controls the force of the stroke. This is a highly realistic representation in that the putter is perpendicular to the direction of the stroke and the direction the ball will travel. The further the putter is from the ball, the further the ball will travel when struck. If it is struck with a great deal of force, the ball bounces off the obstacles and boards outlining the boundaries of the hole.



To simulate uneven grass, a small random factor in the movement of the ball has been included. This means that an exact duplicate of a previous stroke may not give the same results. Furthermore, a ball that is hit too hard will pass right over the hole as it would on a real course. Players will note also that the speed of the ball realistically slows down toward the end of the shot.

Heightening the realism, the order of play is determined by the results of the previous holes. The traditional system of honors employed in golf is employed in

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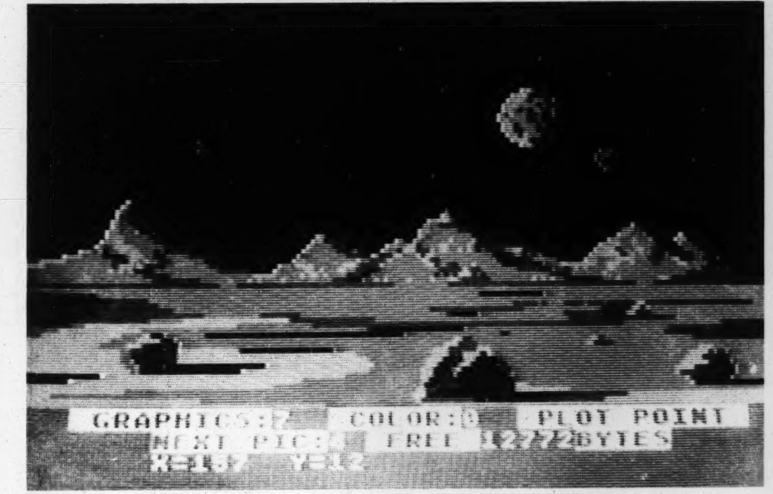

```
GRAPHICS:7   COLOR:0   PLOT POINT
   NEXT PIC:4   FREE 12772BYTES
   X=157   Y=12
```

Scene from BETA FIGHTER during creation using the DRAWPIC graphics editor.

HODGE PODGE: by Marsha Meredith
(Atari and Apple)
NOW AVAILABLE FOR ATARI!!! This captivating program is a marvelous learning device for children from 18 months to 6 years. HODGE PODGE consists of many cartoons, animation and songs which appear when any key on the computer is depressed. A must for any family containing young children.
PRICE. . . . .**$19.95** diskette

☐ **PM EDITOR:** by Dennis Zander (Atari, 16K)
Create your own fast action graphics game for the Atari 400 or 800 using its player missile graphics features. By using player data stored as strings, players can be moved or changed (for animation) at machine language speed. All this is done with string variables (PO$(Y)=SHIP4). This program is designed to permit creation of up to 4 players on the screen, store them as string data and then immediately try them out in the demo game included in the program. Instructions for use in your own game are included. PM EDITOR was used to create the animated characters in **ARTWORX** RINGS OF THE EMPIRE and ENCOUNTER AT QUESTAR IV.
PRICE . . . . **$29.95** cassette **$33.95** diskette

☐ **ROCKET RAIDERS** by Richard Petersen (Atari 24K)
Defend your asteroid base against pulsar bombs, rockets, lasers, and the dreaded "stealth saucer" as aliens attempt to penetrate your protective force field. Precise target sighting allows you to fire at the enemy using magnetic impulse missiles to help protect your colony and its vital structures.
PRICE . . . . **$19.95** cassette **$23.95** diskette

☐ **FOREST FIRE!:** by Richard Petersen (Atari,24K)
Using excellent color graphics, your Atari is turned into a fire scanner to help you direct operations to contain a forest fire. You must compensate for changes in wind, weather and terrain. Not protecting valuable property can result in startling penalties. Life-like variables make FOREST FIRE a very suspenseful and challenging simulation. **PRICE** . . . . **$16.95** cassette **$20.95** diskette

☐ **GIANT SLALOM:** by Dennis Zander (Atari, 16K)
Bring the Winter Olympics to your computer anytime of the year! Use the joystick to guide your skier's path down a giant slalom course consisting of open and closed gates. Choose from three levels of difficulty. Take practice runs or compete against from two to eight additional skiers.
PRICE . . . . **$15.95** cassette **$19.95** diskette

☐ **THE PREDICTOR** by Thomas Barker
(Apple, Atari, TRS-80, North Star and CP/M (M-BASIC).
This is a complete package that covers least squares fitting of parameters for two or more variables. THE PREDICTOR can be used for predicting sales and process behavior, trend analysis, model building and many other uses calling for multilinear regression techniques. Each option in the program is prompted with simple YES/NO commands making it **very** easy to use.
PRICE . . . . **$29.95** diskette

☐ **PILOT:** by Michael Piro (Atari, 16K)
Pilot your small airplane to a successful landing using both joysticks to control throttle and attack angle. PILOT produces a true perspective rendition of the runway, which is constantly changing. Select from two levels of pilot proficiency.
PRICE . . . . **$16.95** cassette **$20.95** diskette

☐ **TEACHER'S PET:** by Arthur Walsh (Atari, Apple, TRS-80, PET, North Star and CP/M (MBASIC) systems).
This is an introduction to computers as well as a learning tool for the young computerist (ages 3-7). The program provides counting practice, letter-word recognition and three levels of math skills.
PRICE . . . . **$14.95** cassette **$18.95** diskette

☐ **MAIL LIST 3.0:** (Atari, Apple and North Star)
The very popular MAIL LIST 2.2 has now been upgraded. Version 3.0 offers enhanced editing capabilities to complement the many other features which have made this program so popular. MAIL LIST is unique in its ability to store a maximum number of addresses on one diskette (typically between 1200 and 2500 names!). Entries can be retrieved by name, keyword(s) or by zip codes. They can be written to a printer or to another file for complete file management. The program produces 1, 2 or 3-up address labels and will sort by zip code (5 or 9 digits) or alphabetically (by last name). Files are easily merged and MAIL LIST will even find and delete duplicate entries! The address files created with MAIL LIST are completely compatible with **ARTWORX** FORM LETTER SYSTEM.
PRICE . . . . **$49.95** diskette

☐ **THE VAULTS OF ZURICH:** by Felix and Greg Herlihy
(Atari, 24K, PET)
Zurich is the banking capital of the world. The rich and powerful deposit their wealth in its famed impregnable vaults. But you, as a master thief, have dared to undertake the boldest heist of the century. You will journey down a maze of corridors and vaults, eluding the most sophisticated security system in the world. Your goal is to reach the Chairman's Chamber to steal the most treasured possession of all: THE OPEC OIL DEEDS!
PRICE . . . . **$21.95** cassette **$25.95** diskette

☐ **BRIDGE 2.0** by Arthur Walsh (Atari (24K), Apple TRS-80, PET, North Star and CP/M (MBASIC) systems)
Rated #1 by Creative Computing, BRIDGE 2.0 is the only program that allows you to both bid for the contract and play out the hand (on defense or offense!). Interesting hands may be replayed using the "duplicate" bridge feature. This is certainly an ideal way to finally learn to play bridge or to get into a game when no other (human) players are available.
PRICE . . . . **$17.95** cassette **$21.95** diskette

☐ **ENCOUNTER AT QUESTAR IV:** by Douglas McFarland
(Atari, 24K)
As helmsman of Rikar starship, you must defend Questar Sector IV from the dreaded Zentarians. Using your plasma beam, hyperspace engines and wits to avoid Zentarian mines and death phasers, you struggle to stay alive. This BASIC/Assembly level program has super sound, full player missile graphics and real time action.
PRICE . . . . **$21.95** cassette **$25.95** diskette

NEW PROGRAMS!

HAZARD RUN: by Dennis Zander (Atari, 16K)
The sheriff has spotted you and you must make the treacherous run through Crooked Canyon past Bryan's Pond to the jump at Hazard Creek and safety. You can even put the joystick-controlled GEE LEE car up on two wheels to make it through some tight spots. A lead foot is not always the answer as you dodge trees, rocks and chickens in this nerve-racking game. HAZARD RUN employs full use of player/missile graphics, re-defined characters and fine scrolling techniques to provide loads of fast action and visual excitement.
PRICE. . . . .**$27.95** cassette **$31.95** diskette

BETA FIGHTER: by Douglas McFarland (Atari, 16K)
See who will be the ace gunner in this action game set on a spectacular Martian landscape. BETA FIGHTER can be played with one or two players and uses player/missile graphics and delightful sound effects.
PRICE. . . . .**$16.95** cassette **$20.95** diskette

DRAWPIC: by Dennis Zander (Atari 16K)
DRAWPIC provides the user with an unbelievably easy way to create screens in graphics modes 3-7. Just sit back with your joystick and use POINT PLOT, DRAW LINE, RUBBER BAND fill and COLOR SET to create beautiful images on your Atari. Full or partial screen images are saved as string data in the program and can be instantly recalled and combined into new images using machine language subroutines. These graphic images can be easily incorporated into your own programs. The images of HODGE PODGE and the landscape of BETA FIGHTER were made using DRAWPIC.
PRICE . . . .**$29.95** cassette **$33.95** diskette

POKER TOURNEY: by Edward Grau
(Atari 32K, Northstar)
You are entered in a high stakes Draw Poker Tournament facing six opponents including Lakewood Louie, Shifty Pete and Dapper Dan. Each has his own style of play and of bluffing. POKER TOURNEY utilizes the Joker, has true table stakes play and each hand is played based on pot odds. The Atari version's graphics and sound are superb of course (programmed by Jerry White) making POKER TOURNEY the class program of its type.
PRICE . . . .**$18.95** cassette **$22.95** diskette

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ARCADE GAMES

Micro Golf. On the first hole, the players shoot in numerical order. After that, the player with the best score in the previous hole goes first, followed by the player with the next best score etc.

In addition to playing the game, there is an option to edit (change) existing holes or produce new holes. The instructions for doing this occupy four typeset pages and cover virtually every possible contingency. We won't try to describe the process here. Suffice it to say, it was relatively easy to create a new hole, although we think it will be a long time before you tire of the 54 separate holes included on the disk.

In summary, *Micro Golf* was great fun and was one of the few games enjoyed by several people who just can't get into action/arcade games.

Peeping Tom

In *Peeping Tom*, Mike Livesay takes a commonplace shoot-'em-up game concept — base at the bottom, aliens hovering overhead which must be shot—and turns it into a novel, interesting challenge. How does he do this? Simply by making the screen into a large window with four panes of glass.

At the beginning, the shades are drawn across all panes except the upper left. In other words, when you start the game you are largely in the dark. You can tell that aliens are firing at you by the traces of their weapons (lasers, cannons, bombs, or whatever they are) at the bottom of the screen where you are.

Initially, you only can fire at random. But it doesn't take long until you hit one or two aliens. As soon as you do, the window shade covering the portion of window that they were flying behind immediately rolls out of the way and you can see everything clear as day.

creative computing
SOFTWARE PROFILE

Name: Peeping Tom

Type: Arcade game

System: 48K Apple, Disk Drive, Paddle recommended

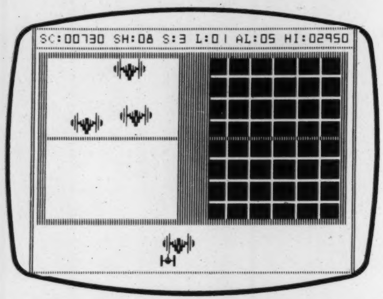
Format: Disk

Language: Machine Language

Summary: Breathes new life into an older concept

Price: $34.95

Manufacturer:
Micro Lab
2310 Skokie Valley Rd.
Highland Park, IL 60035



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Your object, of course, is to eliminate the successive waves of aliens, each one of which flys in a different formation.

The larger aliens start with only five or six on the screen whereas the smaller ones have as many as nine. There are nine different alien shapes in all and five levels of play. On higher levels of play the aliens move faster and shoot more quickly.

You, the player, start with nine ships; the game ends when you have no ships left. You get points both for shooting aliens and raising window shades.

The game is fast moving and employs good color and sound. While it can be played with either keyboard, paddle or joystick, we highly recommend paddle or joystick play.

Pegasus II

In *Pegasus II* you fly an airplane (yes an airplane and not a spaceship!) across terrain consisting of cities, plains, mountains, chasms and the like. On the ground are radar detectors, surface to air missiles which take off in your flight path and things that look like they might be alien robots. You have two weapons at your disposal: a laser beam cannon which shoots straight ahead and bombs which drop with whatever forward momentum is given to them by the plane. In other words, they don't drop straight down.

Each ground target is worth 20 points. During your mission however you will also encounter hostile, aggressive birds, worth 25 points when shot. A group of flying saucers also tries to keep you from completing your mission; these are worth 50 points each when shot.

After a bombing run you get a breather as your plane leaves the target terrain and enters outer space. Here, you encounter dragons lashing out at you with exceptionally long, lethal tongues. They are worth 100 points each although they can be avoided by simply staying on the left edge of the screen. After them you rendezvous with a mother ship for refueling. You then return to the target terrain flying at a higher speed and encountering more birds and dragons.

Eventually, you will get to a tunnel where you encounter "tunnel killers" worth 100 points each when shot. The tunnel killers resemble comets with floating tails. Tunnels come in three flavors: beginner, intermediate and advanced. As it states in the rules, "until you have considerable flying experience you will not reach the tunnel anyhow, so at first your response of which type of tunnel you want will not matter."

creative computing
SOFTWARE PROFILE

Name: Pegasus II

Type: Arcade game

System: 48K Apple, Disk Drive, Joystick

Format: Disk

Language: Machine language

Summary: Challenging, fast moving flying game with the option of user-definable terrain

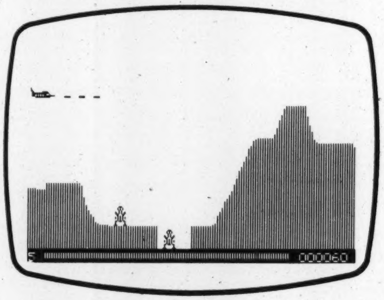
Price: $29.95

Manufacturer:
On-Line Systems
36575 Mudge Ranch Rd.
Coarsegold, CA 93614

In our opinion the game must be played with a joystick. Although a paddle option is included, right and left movement are controlled with the space bar which doesn't provide nearly the degree of control necessary to negotiate the tricky terrain in *Pegasus*. We found one error in the instructions. They state that the A and S keys are used to fire lasers and drop bombs while using joystick controls; this was not true. Rather, the two buttons on the joystick fire and drop bombs.

Pegasus II adds a unique touch found in very few games. It allows you, the user, the option of creating your own terrain. To do this, the user defines 21 "separate frames" of landscape that the program then combines randomly. It is a very simple procedure to generate terrain and users who tire of the terrain which comes with the program will want to take advantage of this option.

Of course, you can make the game as simple or as complex as you wish by generating your own terrain. Indeed, if you want to make it extremely simple you need only generate completely flat terrain for 21 frames. Somehow, this just didn't



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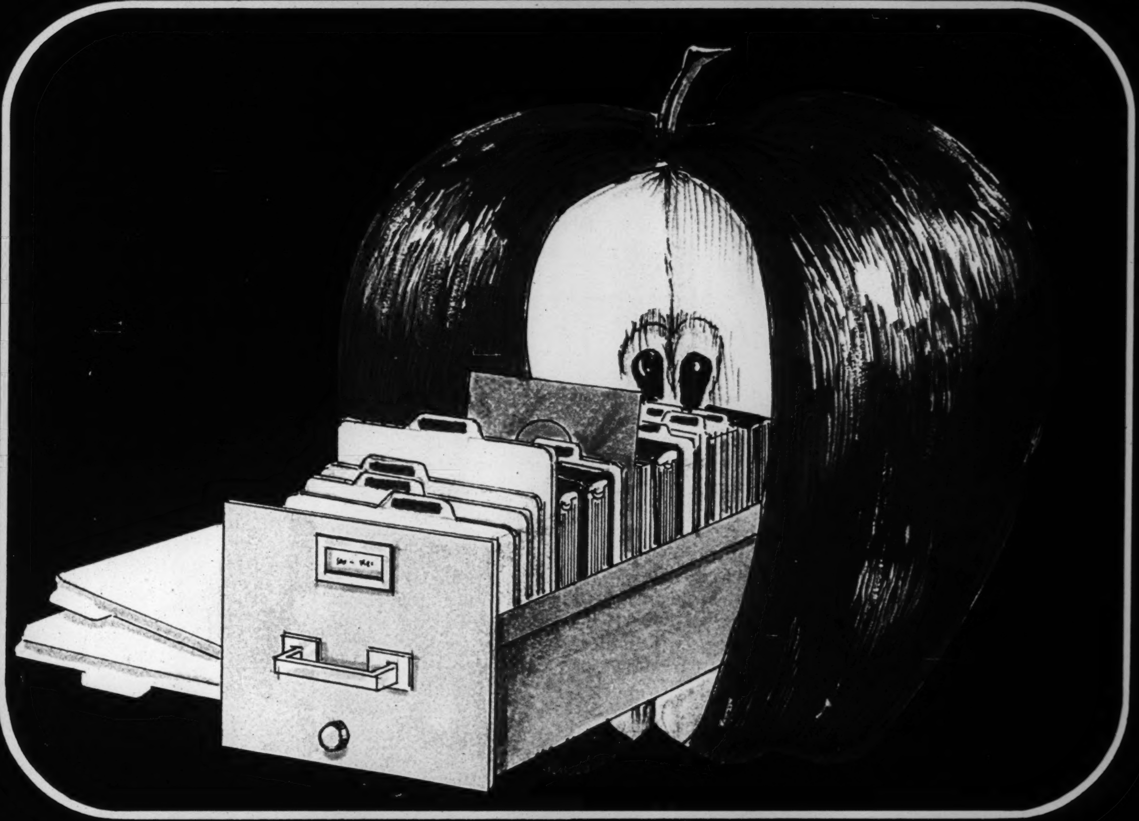

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ARCADE GAMES

seem to be in keeping with the spirit of things and, although the temptation was great, we did not succumb.

The game uses good, hi-res graphics, some color but not much in the way of sound effects. Nevertheless, *Pegasus II* is a challenging game and one which had our player panel coming back for hours.

Photar

We are told on the packaging that "*Photar* is fast. *Photar* is mean. And *Photar* is out to get you. You know the moment the black holes appear that you are in for a lot of trouble. Then comes *Photar*, undaunted by your ceaseless fire. Soon the rings of Saturn doggedly hound your every move, moving in then backing off, while wild stars come screaming in for the kill."

creative computing

SOFTWARE PROFILE

Name: Photar

Type: Arcade game

System: 48K Apple, Disk Drive, Joystick

Format: Disk

Language: Machine Language

Summary: Fast moving derivative of Centipede

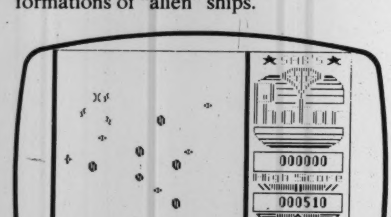
Price: $19.95

Manufacturer:

Softape
10432 Burbank Blvd.
North Hollywood, CA 91601

It all sounds like something out of a marvelous science fiction adventure. And, perhaps a new concept in games. However, what we really have here is a close cousin of the popular coin-op game, Centipede.

However, instead of the Centipede coming in as a continuous worm-like creature from the top of the screen and weaving back and forth, it comes in as formations of "alien" ships.



The spider is replaced by another ship at the bottom of the screen and, occasionally a fast-moving ship careens down from the top of the screen leaving mushrooms—sorry, black holes—in its path. Incidentally, you get only one base in *Photar*.

Obviously, Softape is trying to make this into a distinctly different game from Centipede and they have largely succeeded while retaining all of the fun and attraction of the coin-op arcade version. The only real complaint that we have about *Photar* is that it is rather wearing on your firing finger even though the game has a continuous fire feature similar to the one on the coin-op Centipede games. A Trak Ball controller would be nice too, although a short-throw joystick does just as well. We found the keyboard play option absolutely impossible; a short-throw non-centering joystick is by far the best bet. *Photar* uses relatively little color, but the sound effects are outstanding.

Pinball

Raster Blaster set a new standard for Apple pinball games. It was soon followed by *David's Midnight Magic* and now, from subLogic, we have *"Night Mission" Pinball*, probably the most comprehensive and detailed pinball game yet.

This game simulates an arcade-type pinball game and acts the same in nearly every way. You must insert one or more quarters (press "Q") to add to your credits. Press the start button (S) to begin play. Up to four players can be selected by pressing "S" more than once.

The paddle pushbuttons control the left and right flippers. The left paddle dial controls the ball-launching striker position, and either flipper launches the ball. The right flipper also rotates the "night lane lights" when the lane light system is active.

Hitting any of the keys on the left of the keyboard simulates jostling the machine by bumping it on its left side, whereas right side keyboard keys do the same thing to the right. Too much bumping is risky as you may tilt the machine.

creative computing

SOFTWARE PROFILE

Name: Pinball

Type: Action game

System: 48K Apple, Disk Drive, Paddles recommended

Format: Disk

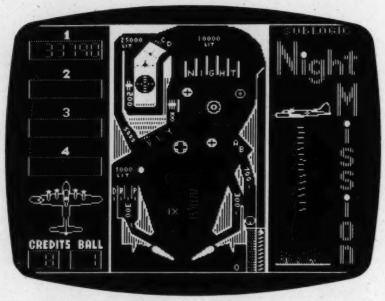
Language: Machine language

Summary: Excellent pinball simulation

Price: $29.95

Manufacturer:

subLogic
201 West Springfield Ave.
Champaign, IL 61820



Ten playing modes are provided. Mode 0 is the standard competition mode and is most like a real pinball game. Modes 1-9 include everything from easy beginner modes to high-speed and slow-motion. In addition, the user may define up to 100 additional modes which are all simultaneously available. Included is a 16-page typeset instruction booklet which describes how to define and make up your own playing modes.

In defining your own modes, you may change items such as free game score, balls per game, forward incline, spinner friction, tilt effect, hole kick, kicker delay, ball speed, bumper impulse, tilt sensitivity, flipper bouncines, and many other variables.

The high score along with current playing mode may be saved to a disk that you provide. The game also has the ability to freeze the play at any point or single step through the play. This is especially useful when you create your own playing modes and want to see exactly what will happen to a ball.

This is an exceptionally impressive simulation and takes full advantage of the graphics, color and sound of the Apple computer.

Roach Hotel

In *Roach Hotel*, a humorous action game, you control a large foot which moves from left to right across the top of the screen. In the center of the screen is an empty building, the Roach Hotel, to which roaches scurry from both sides of the screen. You move your foot back and forth with the game paddle and, when a roach is under it, press the button to release your foot so it crushes the roach.

In addition to the roaches making a beeline for the hotel, there are spiders who merrily dance around the screen. These are poisonous and must be squashed before they bite your foot. Upon stamping out ten spiders, you receive a bonus based on the number of empty spaces still remaining in the hotel.

At the start of the game you have two feet, appropriately enough. You lose a foot each time a spider bites one, but you

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TIME 0077
SCORE 0923

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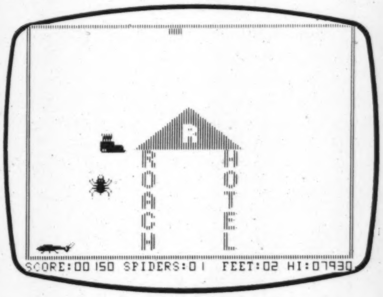
creative computing
SOFTWARE PROFILE

Name: Roach Hotel
Type: Arcade game
System: 48K Apple, Disk Drive, Paddle control
Format: Disk
Language: Machine Language
Summary: Humorous and engaging
Price: $34.95
Manufacturer:
Micro Lab
2310 Skokie Valley Rd.
Highland Park, IL 60035

can get a new one each time you accumulate 2000 points. A dead spider is worth 50 points, a small roach 30 points and a large roach 20 points.

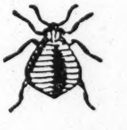
The highest score is recorded as a permanent record on the disk. The information line at the bottom of the screen shows the permanent high-score, current score, the number of spiders currently eliminated toward your count of ten, and the number of feet remaining in the game. You lose a foot from a spider bite or when the hotel is completely full of roaches.



SCORE:00 150 SPIDERS:01 FEET:02 HI:07930

Toward the beginning of the game it is relatively easy to position your foot over a roach and kill it. However, as the game progresses, you will want to keep your foot in the middle of the screen and use the slanted roof of the hotel to guide your foot in the direction of the approaching roaches.

In summary, this is a truly funny game with a new twist. It makes excellent use of graphics, color and sound. And it is one that reviewers of all ages were able to enjoy.



Star Blaster

Star Blaster is a fast-moving arcade/-action game written by Mark Kriegsman and Geoffrey Engelstein. In the game, the player controls the vertical position of a spaceship flying at the right hand side of the screen. Various nasty elements enter the screen from the left and, as the name suggests, the player must blast them away.

The game may be played with either paddles or a joystick. While we would normally elect to use a paddle for a game of this type, we found that the short throw of a joystick was highly desirable. The objects on the screen are moving so quickly that it is nearly impossible to rotate a paddle from one extreme to the other in order to either blast the objects or get out of their way. Thus, the quicker response of a joystick is virtually mandatory for successful play.

In keeping with the tradition of games of this type, the player is given three starships with which to reach his final objective. However, if the player successfully completes a level of play (seven waves of different types of attackers) he is awarded an additional starship.

In the first wave of invaders, an alien ship lays mines across your path. You can either avoid them or blast them out of your way for 15 points each. The mine field is followed by a second wave of three invaders. We found it easiest to lead them to the bottom of the screen and continuously blast away until they fall into your fire. The third wave consists of extremely rapidly moving comets worth 20 points each. We found that firing continuously, moving from the top to bottom of the screen and back again, was the only successful strategy to eliminate at least some of the comets as there is no time to line up and shoot them down after they have appeared on the screen; they are just moving too fast.

A force field appears next; each of your shots releases a bullet (or something) back at you. Incidentally, you must blast a large enough hole in the force field for your spaceship to fit through.

The fifth wave brings you face to face with Guardians which, on lower skill levels, are flying saucers. On higher skill levels, the Guardians become small spaceships which wander from the top to bottom of the screen becoming randomly visible and invisible. Even though you may think you know where they are, you must hit them while they are visible.

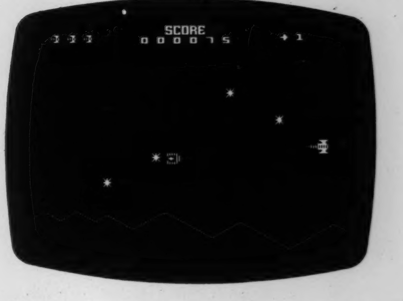
In the sixth wave, you enter a sort of tunnel which frequently changes direction ever so slightly giving one the feeling of an undulating snake. You must not touch its boundaries and you must contend with space rocks that randomly fly through the tunnel at you.

If you have successfully endured all these perils, you come face to face with the Dragonian annihilator ship which hovers on the left side of the screen behind a gigantic force field. The annihilator constantly bombards you with neutron bombs of all sorts which you must either shoot or avoid. At the same time, you must not lose sight of your main mission which is to blast a hole in the force field and finally into the heart of the Dragonian ship. This is by no means an easy task and will have your firing finger crying for relief at the end of the mission.

However, instead of relief you are rewarded with a mighty explosion on the screen, a few outer-space musical notes along with the message that you have earned a bonus ship. Be warned, you will need it, as on each succeeding wave the aliens come faster and fly in more complex patterns than on earlier waves.

If you just don't seem to be able to get by the mines or invaders on the first level but would like to see the entire game, Picadilly has thoughtfully provided a demo mode which allows you to play continuously without any of the alien bullets or other weapons having any effect. Frankly, it was only by using this mode that we were able to find out what went on at the highest levels of play.

If you are playing in the demo mode and you decide you would like to "play for keeps," you may simply press the escape key and start playing for real from that point on. This overcomes the problem that we have found with many games: if a



SCORE
0 0 0 0 7 5

creative computing
SOFTWARE PROFILE

Name: Star Blaster
Type: Arcade Game
System: 48K Apple, Disk Drive, Paddle or Joystick
Format: Disk
Language: Machine
Summary: Challenging action and good graphics
Price: $29.95
Manufacturer:
Picadilly Software
89 Summit Ave.
Summit, NJ 07901

player is not good enough to get by the second or third level, he will never experience the joy of playing at the higher levels or with new formations of aliens. In *Star Blaster*, you can start where you want, at whatever level you wish.

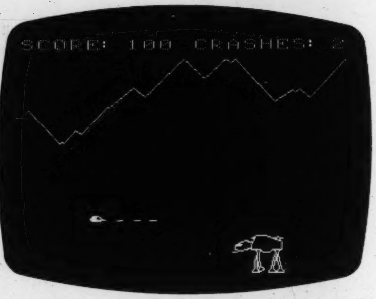
All around, a very good game: graphics, color, sound, and user-friendliness.

Star Clones

The *Star Clones* package consists of four separate games, each one of which is modeled on a situation from the "Empire Strikes Back" or "Star Wars."

In the first game, *Clone Trooper Onslaught*, you are manning a perimeter outpost located at the bottom center of the screen. Clone troopers are approaching your perimeter (the bottom of the screen) at varying speeds from above. At your disposal, you have a laser cannon capable of continuous rapid fire. The direction of fire is controlled by your paddle and the firing by the paddle button. Each trooper that you shoot is worth 10 points while captains (who move more rapidly) are worth 20 points each. As the onslaught progresses, the pace increases and, when ten or more troopers are in sight at once, they combine forces and move much more quickly. We found that planning ahead and spreading wide fields of fire was the best strategy for stopping the most troopers.

The second game is called "Attack of the Metal Monster Clones" (an equivalent of the giant walkers). You fly a fighter in repeated passes from the left to the right of the screen while the monster walks from the right to the left. To defeat a monster, you must swoop down with your fighter and fire directly into the vulnerable viewport. If you miss, you must pull up sharply and try again, all the while avoiding the shots coming from the monster. If you are hit by a shot or if you make contact with the monster at any point (you can't fly through his legs), your ship immediately disintegrates and the monster picks up his pace and rapidly crosses to the left edge of the screen.



SCORE: 100 CRASHES: 2

Game 3, "Desert Scout Daredevil" has you riding a land speeder across the desert. A dangerous ditch toward the end of your ride is filled with robot clones who are trying to jump into your ship. By controlling the speed of your ship with your paddle knob and shooting the robots with the fire button, you try to get over each ditch and deliver an important message. A crash results when you hit a robot clone, or jump the wrong distance.

In game 4, "Assault on Star Clone City," you must navigate through a swarm of asteroids and star clone fighter ships to get to your city on the surface of the planet. In this case, you control the position of your ship at the left edge of the screen with the paddle as asteroids and fighter ships come at you from the right side. Occasionally, master ships approach which fire twice as fast as the regular fighters. The closer you get to Star Clone City, the more asteroids you encounter.

The package has many options for each of the four games. In particular, up to four players may participate, each one of whom may play at his own skill level (three levels allowed). Also, it is possible to play each game individually which is called a simulation, or to specify an entire mission of all four games. The missions are numbered from zero to nine with zero being the easiest and nine being extremely difficult. As with most Apple games today, sound may be turned on or off.

In summary, you will probably find that you like one or two of these games more than the others. However, we found the challenge of flying a succesful mission would inspire players to perfect their skill at all of the games.

creative computing

SOFTWARE PROFILE

Name: Star Clones
Type: Arcade game
System: 48K Apple, Disk Drive, Paddles
Format: Disk
Language: Machine language
Summary: Four games provide diversity and challenge.
Price: $29.95
Manufacturer:
Creative Computing Software
39 E. Hanover Ave.
Morris Plains, NJ 07960.

Suicide !

Suicide is a rather novel game, unlike anything we have seen before. Apparently, a strange race of aliens called the Cretins are bent on killing themselves. The creatures look like small insects (a round head with two eyes and a smile, two antennae and two feet). As they hurl themselves toward the surface of the earth they have large smiles. However, if you prevent them from committing suicide by holding a spring board under them, causing them to bounce back-up their smiles turn into a frown.

For some obscure reason which is not shared with us in the instructions, you *must* save the slow-moving creature who falls upside down but you *must not* save the slow-moving creature with one missing antenna.

If you err, and do save the slow-moving creature with the missing antennae, you lose one trampoline. Also, if you do not save the upside down creature you lose a trampoline.

creative computing

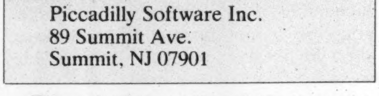
SOFTWARE PROFILE

Name: Suicide!
Type: Arcade Game
System: 48K Apple, Disk Drive, Paddles
Format: Disk
Language: Machine language
Summary: Novel theme; good fun
Price: $29.95
Manufacturer:
Piccadilly Software Inc.
89 Summit Ave.
Summit, NJ 07901

The only thing under player control is the trampoline at the bottom of the screen. The program unfortunately, uses only about 1/2 of the screen width. Nevertheless, the action is plenty fast. You may control the left/right movement of the trampoline with either a paddle or joystick or the two arrow keys on the Apple. There is no firing.

To add spice to the game, not all of the creatures come all the way down; rather they come down almost to the ground and bounce back up on their own. Thus, you may well be "faked out" when you try to save one creature at the far right or left while letting another one smash into the earth at the opposite side of the screen.

You get ten points for each creature saved and lose ten points for each creature who commits suicide. Reaching the next level is worth a bonus of 500 points and



TIME: 00028
CC'S: 00006
SCORE 00150
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2

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ARCADE GAMES

an extra bonus of between 1000 and 3000 points is awarded for saving a fast-moving mystery creature at the end of a level. Miss the upside down creature or catch the creature with one antenna and you also lose 200 points.

Taxman

The instruction booklet calls *Taxman* "the definitive version of the popular game" and indeed it is virtually a 100% copy of Pac-Man. Just how long Atari will let H.A.L. Labs get away with selling this is anyone's guess, but if you are looking for Pac-Man on the Apple this is it.

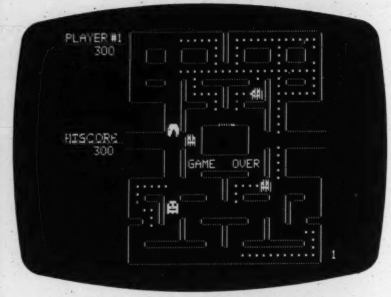
The authors try to position the game slightly differently, perhaps to ward off the legions of lawyers from Atari. In particular, the rules state, "In the land of Tanstaafl, the citizens are in revolt, depriving the government of its rightful revenue, and rioting in the streets. You are the TAX MAN, self-appointed champion of the government coffers. Silly citizens don't know what's good for them and have developed rebellious tendencies. They are armed and dangerous. To help you, there are tax centers in each precinct. Passing through one gives you temporary power to pacify the angry rebels. But, alas, they are soon back on the streets causing more damage and destruction.

"Occasionally, government bonuses will appear. Quickly grab these to assure maximum profits before the feds take back what they offer. These fruit taste delicious but be careful; the citizens resent this and will do their utmost to prevent your collecting these bonuses."

The game has a nice touch, in that you may specify at the beginning whether it is to be played in black and white or color. In color, the creatures turn blue when they may be caught, whereas in black and white, they change to off-white.

creative computing
SOFTWARE PROFILE

Name: Taxman
Type: Arcade
System: 48K Apple, Disk Drive
Format: Disk
Language: Machine language
Summary: Exact copy of Pac-Man; great fun.
Price: $23
Manufacturer:
H.A.L. Labs,
393 West La Cadena, Suite 20,
Riverside, CA 92501



The program can be played only from the keyboard and the four keys chosen are rather close to each other, making for occasional hand tanglement. On the other hand, we found this to be the most responsive of all the Pac-Man-type games currently on the market when played from the keyboard.

The game allows for up to five players. Each player has three tax men to begin with; an extra one is awarded at 10,000 points.

We would have been happier had this game included a joystick option; nevertheless it is a delightful game as we all know from the enormous success it has enjoyed in the coin-op arcades.

Tumble Bugs a.k.a. Dung Beetles

Although the version of the program we have is called *Dung Beetles*, we are told by the manufacturer that by the time it reaches the marketplace it will have been renamed *Tumble Bugs*. This is a pity; we rather like the name *Dung Beetles*.

The object of the game is to move your player around a maze and clear away all the white dots. Sound familiar? Ah, yes. But it's not. As you move around the screen you leave a trail of red dots behind you. Voracious dung beetles wander the maze randomly until they cross your trail. They then begin to follow these trails eating the red dots as they move.

If you avoid them and clear the maze you are rewarded with a harder maze, more white dots and eight new dung beetles. Since color plays an important role in the game, we recommend that you use a color monitor or TV set.

Each white dot on the maze is worth ten points. One point is subtracted from your score for every second you are unable to eat a dot, so speed and planning are important.

Furthermore, you can't see the entire maze at once. A "magic magnifier box" travels around with you and magnifies those portions of the maze closest to your location. Although you can see portions of the maze beyond the edge of the magnifier, it is rarely possible to locate more than three or four of the *Dung Beetles* with any accuracy. Upon capture, you dissolve with a ringing whine after which a chorus of *Dung Beetles* says "We gottcha!" Yes, they really say it through your very own Apple speaker.

The game may be played using either keyboard or joystick. We found it far easier to play with a joystick. Furthermore, a self-centering, switch-type joystick (Atari, Newport, etc.) was far superior to a continuously variable joystick.

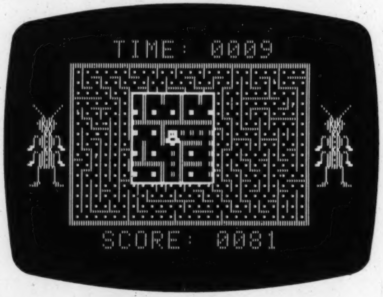
creative computing
SOFTWARE PROFILE

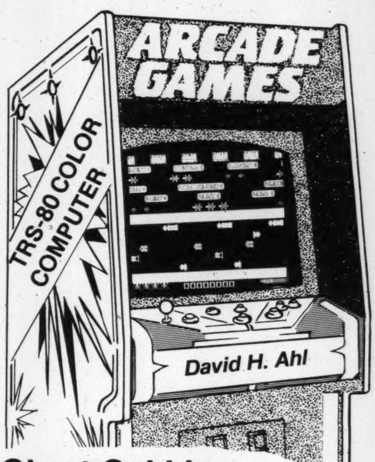
Name: Tumble Bugs (Dung Beetles)
Type: Arcade
System: 48K Apple, Disk Drive, Joystick recommended
Format: Disk
Language: Machine language
Price: $29.95
Manufacturer:
Datasoft Inc.
16606 Schoenborn St.
Sepulveda, CA 91343

The instructions give some strategy hints for playing: "*Dung Beetles* are not very smart creatures (you are what you eat). Once they start eating they cannot tell the difference between an old trail and a new trail. This allows you to avoid them by maneuvering around islands and leaving forked trails of red dots to lead them off in other directions. There are no islands in the second maze if you get that far.

"*Dung Beetles* are slow but persistent. They move half as fast as the player so you can easily outrun them. It is recommended that portions of the maze be cleared at a time rather than wandering the whole maze risking capture."

In summmary, we found this latest creation of Bob Bishop humorously entertaining. It was particularly enjoyed by the younger members on our playing panel when they could shoulder the adults aside.

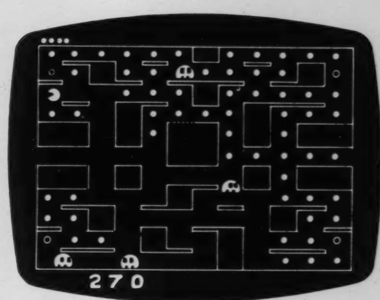




Ghost Gobbler

Surprise! Surprise! Another version of Pac-Man. No attempt has been made to disguise the fact that *Ghost Gobbler* is an imitation of Pac-Man. The instructions tell us that "you must gobble all of the food dots while avoiding the ghosts. There are four 'energizer' dots which will make the ghosts turn blue and become scared. the ghosts remain scared for a variable period of time (depending on which board you are currently on) and, then they will blink for two seconds and return to their normal color. While the ghosts are scared, blinking or just after they have returned to normal color, you may eat them for 200, 400, 800, or 1600 points respectively.

Bonus shapes (plum, cherries, mushroom, happy face, etc.) appear just below the center prison twice during each board. These shapes are worth bonus points (100 points on board one increasing to 5000 points on boards 17 or over). There are sixteen skill levels and, as the skill level increases, several things happen: your gobbler slows down, the ghosts follow the gobbler more closely, and the scared ghosts run away more cleverly.



At the center bottom of the field is a teleportation spot which immediately transports your gobbler to the upper center of the screen. The ghosts cannot follow you through the teleporter which works only one way. Several players found this very confusing during play of the game because, having cleared the top of the screen they were attempting to clear the bottom and did not wish to be teleported away from the area they were clearing.

creative computing
SOFTWARE PROFILE

Name: Ghost Gobbler
Type: Arcade game
System: 16K TRS-80 Color Computer
Format: Cassette
Language: Machine language
Summary: Nice version of Pac-Man
Price: $21.95
Manufacturer:
Spectral Associates
141 Harvard Ave.
Tacoma, WA 98466

You start with five gobblers and the number remaining is displayed in the upper left corner of the screen. Five additional gobblers may be awarded during the play of the game for each 10,000 points accumulated.

In summary, the game is a good imitation of Pac-Man. It, like the other TRS-80 Color Computer Games, suffers from the horrible imprecision of the Color Computer joystick. Nevertheless, if you enjoy Pac-Man, chances are you'll like *Ghost Gobbler* too.

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CIRCLE 233 ON READER SERVICE CARD

ARCADE GAMES
Apple II
Atari
Dale Archibald

Star Blazer

Star Blazer is a Tony Suzuki (*Alien Rain*) arcade game that blends flicker-free animation, some of the best graphics around, appropriate sound effects, and wit.

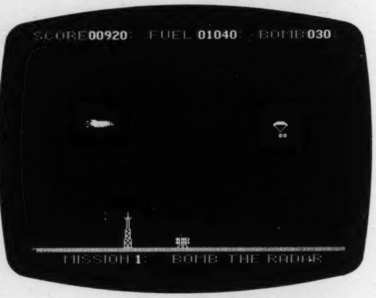
Your mission is to fly one of your three beat-up old WW III fighters through five missions. As you roar along, you use up fuel. You use more by firing your guns; below a certain altitude, you drop bombs instead.

Your first mission is to destroy a radar installation. You rocket along just above the ground. Every time you push the joystick button (you can use the keyboard instead of a joystick) you see a bomb drop. They arch toward the ground.

If you are accurate, your bombs will destroy a structure with an appropriate display and squinching sound. If you are inaccurate, the bomb(s) will miss. Worse yet, one might land in a tree, stick in the branches, and you'll lose points. (We don't pick on pawpaws in these pawts, pawdner.)

Of course, there are complications. Just below strafing height, protruding into your path, are high-tension poles. You must climb over those unless you have suicidal tendencies.

Also, while you are zipping along, so is your fuel and bomb supply. At intervals, a supply plane roars past above you and drops a parachute of fuel and bomb. If you maneuver through the falling supply correctly, you will be refueled and refurbished. Miss, or have it stolen by the great invulnerable bird of passage, and you could come to a sloppy end when your fuel runs out.



Star Blazer.

Once you have finished your first mission, you must obliterate a speeding tank. Unfortunately, it's faster than your plane. (Everything seems like a greyhound compared to the old WW III clunkers.)

You roar toward the right, trying to find the way to knock out the tank. It slows down, but whenever you try to catch up, it outdistances you and your bombs fall behind or get caught in a cactus. At times, they bounce out of the cactus and blow up on the sands.

Meanwhile, missiles come toward you from the right. There is a way to bomb the tank, and it has to do with the way you attack. Hint: watch how your bombs drop while you're on your first mission. Experiment.

It is actually not too hard once you learn the secret. (Before Doug Carlston told me, I only got by the active armor when the parachute on my fuel dump was cut off by one of the missiles. The fuel landed on the tank and blew it up.) Again, the bird will steal the parachute and fuel if the missiles don't hit it.

The next mission is to bomb the ICBM. In this mission, aircraft flying ahead of you drop sky-mines. These are gadgets that float like balloons. The mines or the planes will knock you down. The aircraft also strip the parachute from over the fuel, just to make it difficult.

You got past that one, hmm? Back to the tank again. This time, though, it's supplied with heat-seeking missiles that will follow you and fly right up your tailpipe unless you take rapid evasive action. To add to the difficulty, the missiles coming from the right side fire at you.

Gasp, pant. So you have blasted the second tank (and there is a way that combines the earlier tank-whipping tactic with another tactic to knock out the heat-seekers). Now you must cope with heat-seeking missiles, aircraft, aerial mines, and...I imagine...the great bird of unhappiness.

Your target is the headquarters building of the enemy Bungeling Empire.

The concept is fun, the execution flawless. I wish the game would allow you to keep the high score on the disk. It should have firing instructions at the beginning of the program, and the intro is a bit long. Otherwise, it's a great program.

You can turn the sound off if you like, and freeze play.

creative computing

SOFTWARE PROFILE

Name: Star Blazer
Type: Space arcade
System: 48K Apple II or II+, 3.2 or 3.3 Disk Drive, Joystick optional, but recommended; Atari 400 or 800, 24K
Format: Apple and Atari Disk
Language: Assembly
Summary: Slambang shoot-'em-up with great graphics
Price: $31.95
Manufacturer:
Broderbund Software
1938 Fourth St.
San Rafael, CA 94901

Dale Archibald, 1817 Third Ave. N., Minneapolis, MN 55405.

Twerps

Twerps is another multi-level game. As Captain Twerp, you must bash your way through orbiting satellites and rescue a shipload of stranded Twerps. Written by Dan Thompson, this is a well-planned program from beginning to end.

You can use keyboard, paddles, joysticks, or the Sirius Joyport, and select a difficulty from one through eight, leave the sound on or off, and freeze the game while you are playing.

The game starts with a graphic of a spaceship exploding, and the escaped Twerps plummeting into holes on the planet surface, leaving only their antennae protruding.

creative computing

SOFTWARE PROFILE

Name: Twerps
Type: Space arcade
System: 48K Apple II or II+, 3.2 or 3.3 Disk Drive, Paddles, Joystick optional
Format: Disk
Language: Assembly
Summary: An intricate space game with some nice twists
Price: $29.95
Manufacturer:
Sirius Software, Inc.
10364 Rockingham Dr.
Sacramento, CA 95827

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Four For Fun — Games For The Apple II

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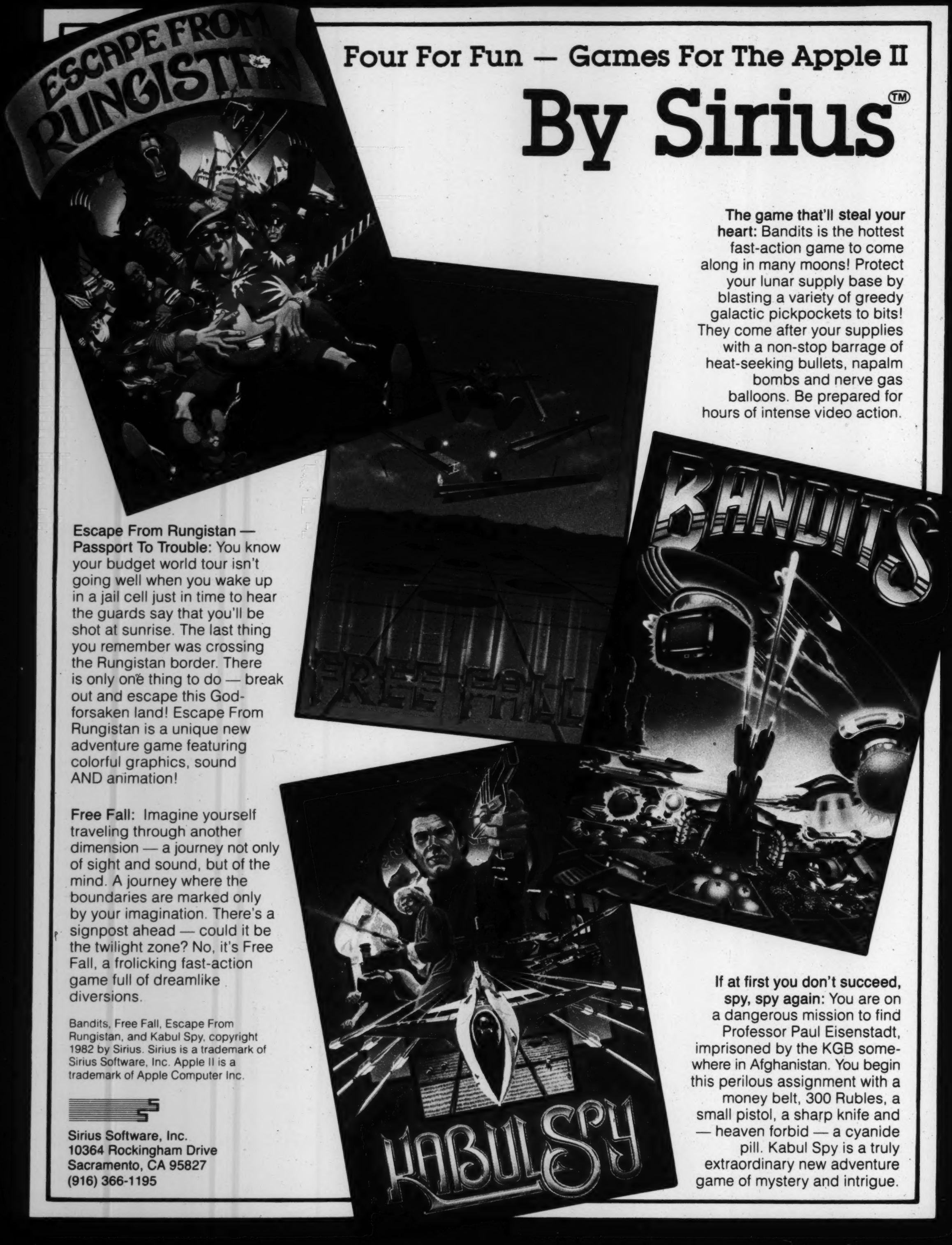

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Sirius Software, Inc.
10364 Rockingham Drive
Sacramento, CA 95827
(916) 366-1195

If at first you don't succeed, spy, spy again: You are on a dangerous mission to find Professor Paul Eisenstadt, imprisoned by the KGB somewhere in Afghanistan. You begin this perilous assignment with a money belt, 300 Rubles, a small pistol, a sharp knife and — heaven forbid — a cyanide pill. Kabul Spy is a truly extraordinary new adventure game of mystery and intrigue.

CIRCLE 235 ON READER SERVICE CARD

Archibald/Twerps, continued...

Next, you see the Twerpstation, with your little green self going down the tube. Uh, just as far as your ship, which is then launched.

Joystick control is good at this point, because you must blast your way through four rows of marching monitors moving vertically, two up, two down. You must move from the right side through the gaps you blast to reach the planet. Of course, the monitors shoot back and ram you.

At the top of the screen is your fuel gauge. Although you have three ships, if you run out of fuel the game is over.

Now the scene changes to the surface of the planet. In the craters are the crouching Twerpfolk. You must maneuver your ship to a landing on the blinking landing pad, using the fire button for thrust as needed.

After you have landed, your Twerpmobile rushes you to the lower left corner. (At this point, I switched from the joystick to the keyboard. The joystick is wrong for this motion, as far as I can tell.)

You move Captain Twerp around the landscape toward craters with feelers. When you press the fire button or space bar, the occupant joints you.

Meanwhile, indestructible Glingas and Gleepnoks relieve you of your rescuees. Glingas grab Twerps and drop them into empty craters. The Gleepnok is a killer. You escape both of these by diving into empty craters.

When you rescue as many Twerps as possible, you go back to the Twerpmobile and hit the fire button. This returns you to the ship, which automatically blasts off.

Again you are faced with replenished orbiters through which you must blast a path. When you return to the Twerpstation, you refuel and gain points.

Orbiters are worth four points, rescued Twerps 15, unrescued Twerps minus-20. Any leftover fuel is added to your score.

"It's a note from the computer."

ARCADE GAMES
Apple II
Michael Coffey

Swashbuckler

If you like stabbing people or small animals, this game is for you. No kidding. *Swashbuckler* is a game whose object is to kill people with a sword. The more you kill, the better your score.

You would be surprised what a good feeling it is to see your opponent fall into a heap on the floor. Just wait 'til you see the variety of opponents: you'll find a one-legged man, a snake, a caveman, a medieval bad guy and countless others.

Even the scenery changes as you master the key strokes that control your animated swordsman. As you gain dexterity with the controls, the bad guys will invade your space with greater frequency.

Swashbuckler animates up to three men at a time. You control the central figure. The other two will wave their arms, swords or clubs at your man.

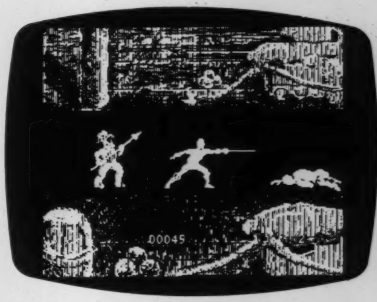
The early opponents show few skills. They sidle up to you and hack away. The only difficulty lies in their relentlessness.

After you mutilate a few fellows, a new character emerges. He's a snake and you won't know how to kill him. You have to learn a new maneuver.

By the time you have extinguished about twenty lives, the party will liven up unmercifully. You will greet a new guest within two seconds after disposing of an older one.

While you are dueling, one or two scorpions, rats, or other animals may appear. Each species wreaks a different brand of havoc. Some cause instant death, others merely cripple.

You control your man with various letter keys. He can move left, turn around and move right. He can stand on guard, move his sword up or down, thrust it or lunge.



Swashbuckler.

Swashbuckler is creatively animated with good responsiveness and gradually increasing difficulty. For those who feel lost in space, it's a good change of pace.

creative computing

SOFTWARE PROFILE

Name: Swashbuckler
Type: Simulated Action
System: Apple II
Format: Disk
Language: 6502
Summary: Stunning
Price: $34.95
Manufacturer:
Datamost
9748 Cozycroft Ave.
Chatsworth, CA 91311

Microwave

Watch out Pac-Man. Teddy, the salvage man, does everything you do and more. What's more, Teddy is cuter than you. Teddy is part of a very original maze game called *Microwave* by Jay Zimmerman and James Nitchals.

creative computing

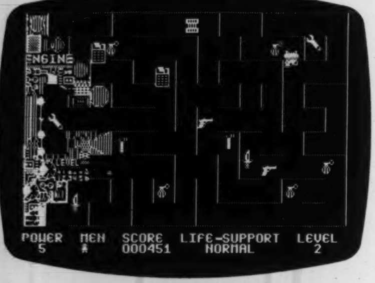
SOFTWARE PROFILE

Name: Microwave
Type: Arcade game
System: Apple II
Format: Disk
Language: 6502
Summary: Amazing
Price: $34.95
Manufacturer:
Cavalier Computer
P.O. Box 2032
Del Mar, CA 92014

ARCADE GAMES

Teddy's mission (and yours) is to clean up spaceships while nasty bad guys try to eliminate you. By setting up microwave dishes, you can arrange for the bad guys to be demolished. Each time you finish with a spaceship, a different one appears.

While Teddy runs around spaceships, *Microwave* plays music, changing its tune frequently. This music can hook whole rooms full of people into fighting over who plays next.



Microwave.

Teddy responds to either the keyboard or the joystick. He pays better attention to the joystick, taking corners and backing up as promptly as any character we have seen.

Simple objects on the screen include wrenches, knives and calculators. Each maze is full of these until you collect them all. Other objects include power packs and pineapple bombs.

Picking up a power pack enables Teddy to deploy a microwave dish at will. Stepping on a pineapple at the wrong time makes Teddy go bye-bye.

Microwave dishes are the key to advanced play and high scores. The bad guys react to a microwave dish the same way our cat used to react to the microwave oven: They stay away because they know what is good for them.

Teddy can walk through the microwave unscathed. You must learn where and when to deploy the dishes. You possess a limited number of them and each one is good for only a limited time.

The subtleties of the game will please the most experienced game freaks. You will play several rounds, for example, before learning how the hand grenades work. You may play several more before figuring out the use of the microwave dishes.

We heartily recommend *Microwave* to the casual as well as the demanding gamer. The graphics, responsiveness and sound effects are all excellent.

Bug Attack

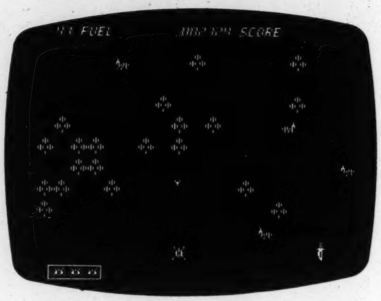
Debuggers take notice: your ultimate challenge awaits you. *Bug Attack* causes manifest infestation of any Apple II computer.

After seeing and hearing a splendid introductory explosion, you are thrown into a cactus garden. Soon you notice two ants creeping amidst the cacti. Never mind how cute they are, shoot them. If you don't, they throw daggers at you.

Okay, have you gotten the two ants yet? Watch out for the millipedes. These guys move faster than the ants (they have more legs) and can kill just by trampling you. Should you wipe out all the millipedes, you will be confronted with a more serious wave of ants.

The game heats up as you dispatch the ants and start on the medflies (this game was *obviously* written in California). You'll want to reach for the DDT when you see these flies jitterbugging on the screen. Up, down, left, right they go in abominably unpredicatable fashion.

More ants, 'pedes and flies swarm in as you shoot your way toward intermission. Finally, you take a rest as a celebrity insect pollinates a flower to the applause of the bug grandstand.



Bug Attack.

Now for some good news and some bad news. First, the bad news: There are more ants to shoot. Now the good news: you have graduated from the cactus garden to the clover patch. In the clover patch, you must shoot faster to get the same results as before. This effect is called "intensity enhancement."

After a couple more rounds of ants, millipedes and medflies, the program begins to show some respect. It moves you to the flower garden. Unfortunately, those bugs are boogying like mad and you really can't smell the daffodils.

Bug Attack is painfully frustrating. Arcaders who thrive on extended shooting sessions will find it a worthy test.

Play can be controlled from the keyboard (A and S to move left and right, space bar to shoot) or from the paddle (twist knob to move, press button to shoot).

The graphics and sounds are professionally programmed and the difficulty levels are carefully graduated. After experiencing this brand of buggery, you won't mind working with the kind you find in your own programs. ☐

creative computing

SOFTWARE PROFILE

Name: Bug Attack

Type: Arcade game

System: Apple II

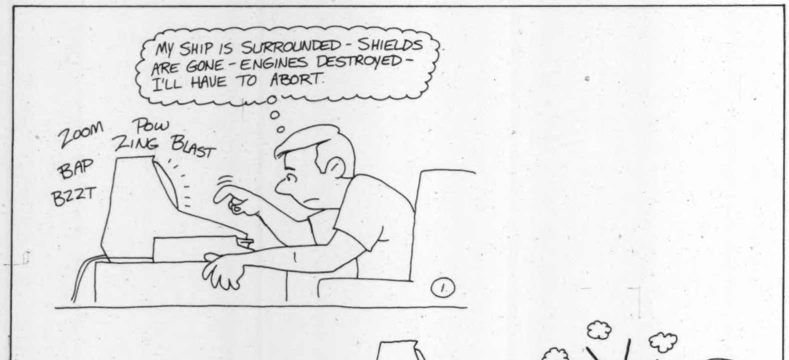
Format: Disk

Language: 6502

Summary: Challenging

Price: $29.95

Manufacturer:
Cavalier Computer
P.O. Box 2032
Del Mar, CA 92014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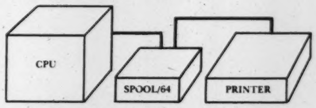

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Four New Atari Arcade Games

Not Just Fun in Games

John Anderson

Of all microcomputer inamorati, Atari owners probably take game programs most seriously. They are jaded; it's tough impressing the crowd for whom *Star Raiders* is invariably among the first programs ever booted. They expect more. Their machines, after all, were designed by games experts and exhibit advanced gaming capabilities. These capabilities are only now being fully explored, and are evolving, by leaps and bounds, into an art form.

Games offer an interactive and involving means by which to demonstrate strides in color graphics and sound synthesis. In the process, they afford a great deal of creative freedom to the programmer, not to mention hours of fun for the player. Still, a majority of Atari owners do not consider games mere frivolity. A swiftly growing market attests to this.

This has led to at least two identifiable results: an explosion of third-party software, some showing real promise, and translations of first-rate Apple programs for the Atari. We shall examine several of these here.

---

creative computing

SOFTWARE PROFILE

Name: Protector

Type: Arcade Game

System: Atari 400/800 32K

Format: Cassette or Disk

Language: Machine

Summary: Compelling and Addictive

Price: $29.95

Manufacturer:
Synapse Software
820 Coventry Rd.
Kensington, CA 94707

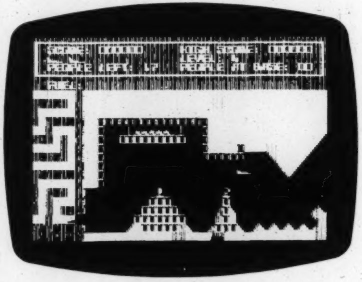
Protector

I should provide a little background concerning this program, as it has an interesting past. Toward the end of last year, I reviewed a version of *Protector* written by Mike Potter and released by Crystal Software. The review, which appeared in another magazine, took the program to task for a number of flaws, "quirky bugs," and disappointing features. This was unfortunately true of the Crystalware version, and ruined an otherwise promising game. It was mysterious to me why an inspired program employing sophisticated techniques should be released in such a state.

The reason surfaced early this year, with the release of *Protector* from Synapse Software, Mr. Potter's new employer. It seems that when Mr. Potter left, his old company decided to market his as-yet-unfinished program. The Synapse version, I'm happy to report, not only corrects all the faults of the earlier version, but includes several new features, and to top it off, costs less than its predecessor. Needless to say, steer for Synapse *Protector* and away from any other.

The game is one of the most polished efforts I have seen from a third party source. It is exceptionally dramatic in its graphics and sound effects, and the animation is mirror smooth.

A great deal goes on in *Protector*, and mastery of the game requires a substantial amount of time. The game is roughly modeled after the arcade game *Defender*. As the pilot of your rocket fighter, you encounter pulse-trackers, meteoroids, laser traps, a volcano, an evil alien ship, and 18 people in desperate need of your help. You must maneuver your ship so as to airlift these people from their beleaguered city to the City of New Hope, and from there to safety in an underground fortress.



Protector.

You must act before they are heartlessly dropped into the volcano by the tractor beam of the alien ship, and before the volcano erupts and destroys the City of New Hope. You must also watch the fuel tank—and sometimes face the decision to refuel or to save some lives at the cost of your own. You can not always do both.

By far the best thing about the game is the horizontally scrolling terrain graphics. The overall goal is to create a "microworld"—a fantasyland one screen high by four or five screens long. Fine scrolling and player/missile techniques are employed to very pleasing effect. For demonstration purposes alone, this program is worthwhile.

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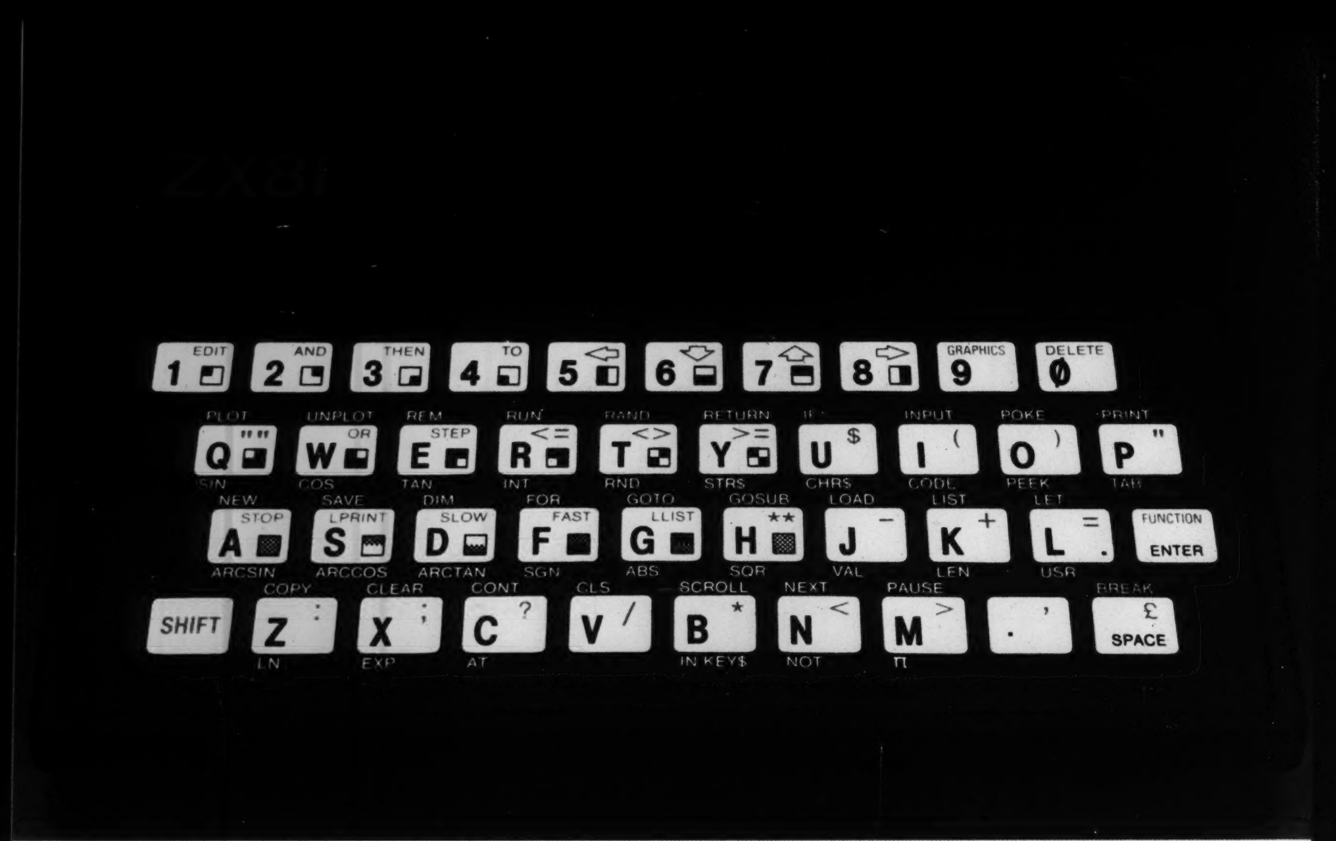
ZX81
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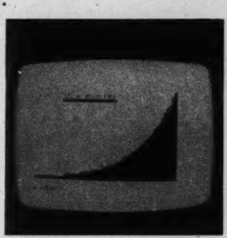

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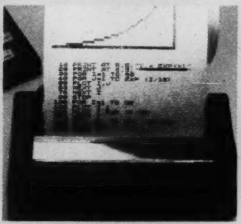

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Sound effects add much to the illusion, and the title music is quite good.

The feeling of flight is accentuated as you dive to the rescue. Time ticks off as the indestructible alien saucer beams the victims up. Pulse trackers nudge dangerously close. Careful when you return fire: their favorite trick is to get you to hit innocent bystanders.

If you get all the remaining people to the City of New Hope, you can then move them through the laser field toward your goal. You must then watch for laser bases and meteoroids. When fuel runs low, you must return to base to refuel. Docking can be a tricky and sometimes fatal task.

The game is paced into six levels of difficulty, graduated to present more aggressive aliens and more complex architecture through which to navigate. The merest graze of scenery, pulse-tracker, meteoroid, laser fire, or tractor beam, and you go down in a dizzying spin. An ambulance shoots out immediately to drag you away—what's left of you, that is. Better luck with your next ship.

I have very few reservations concerning *Protector*. As soon as a level loses its challenge, you may advance to the challenge of a new level. The highest level is very tough indeed. You may get a little tired of hitting things after a while, but after all, that's your own fault, right? Next time, be more careful.

Chicken

Mr. Potter has also created a children's game which will keep many adults busy after the kids have been tucked in. *Chicken* may be played with a joystick, but the responsiveness of a paddle is recommended to really rack up a score. Conceptually close to the arcade game *Avalanche*, the object is as follows: you, as chicken, must catch in your cart all the eggs dropped by a fox scampering across the top of the screen.

creative computing

SOFTWARE PROFILE

Name: Chicken

Type: Arcade Game

System: Atari 400/800 16K

Format: Cassette or Disk

Language: Machine

Summary: Silly, but fun—kids will love it

Price: $29.95

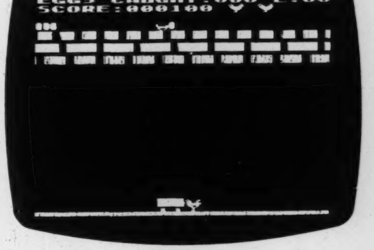
Manufacturer:
Synapse Software
820 Coventry Rd.
Kensington, CA 94707

If you miss an egg, it hits the ground and cracks, and a peeping chick appears. As a chicken, you must fight back the instinctual urge to sit on the eggs you drop—an understandable but annoying habit. The trigger allows you a fluttering leap over the chicks in your quest to catch more eggs.

This may sound somewhat bizarre, and in fact it is. But it is also guaranteed to bring a smile to your face as well as to the kids' faces. As rounds progress, the action becomes more and more frenetic, with laughter as result. A recent competition among adults playtesting caused a bout of hysteria. It felt very good.

If you do plop down on a chick, a huffy farmer strides across the screen and gives you the boot. The addiction level is high, and the game is refreshingly violence-free. By the time you have caught 40 or 50 eggs, your reasoning powers are on the wane. Ever hear the term "twitch game?" This game may be its namesake.

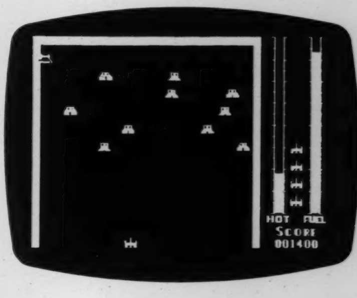
There is a dumb problem with *Chicken*, but it is worth mentioning. In an effort to make the game playable with stick or paddle, only one controller port is used. This means you must pass one paddle between players. This is by no means a major complaint, it just makes the game a bit less than it might be. The graphics and sound in *Chicken*, like those of *Protector*, are superlative, complete with barnyard music, the plop of dropped eggs, the peeping of chicks, and the fluttering of wings in a futile stab at flight. I've had an opportunity to learn about Mr. Potter's latest work, now in progress. I've promised not to spill a word, but I will tell you it sounds incredible.



Chicken.

Threshold

If I can get my wife to stop playing *Chicken*, I'm likely to take another shot at *Threshold*, which probably stacks up as the best "Galaxian-style" invaders game to date for the Atari. Atari owners will happily note that *Threshold* has been translated from the Apple, and that On-Line Systems is in the process of translating many of its popular Apple programs for the Atari. Also, new translations of best-selling Apple games are now available: *Apple Panic*, *Raster Blaster*, and *Crossfire*, to name a few. The translations of these games are at least as good, if not better, than their original versions. *Threshold* uses player/missile graphics, and *Raster Blaster* makes use of multi-channel sound.



Threshold.

Threshold is in the venerable tradition of laser-fire space wars (kill, kill, kill!) and it is superb. The alien waves in this game are ever-changing and wonderfully despicable. Your ships are armed with lasers and hyperwarp drivers that can temporarily slow down time, giving you a better chance to target the enemy. Your arsenal has limitations, however. The lasers can overheat and will shut themselves down until sufficiently cooled. You may invoke hyperwarp only once per ship, and each ship has a limited fuel supply. As for maneuverability, have you ever had the misfortune to be driving a power-steered vehicle that stalls while you're driving? That's the way the stick feels in *Threshold*.

creative computing

SOFTWARE PROFILE

Name: Threshold

Type: Arcade Game

System: Atari 400/800 40K

Format: Disk

Language: Machine

Summary: Best alien shoot-out to date

Price: $39.95

Manufacturer:
On-Line Systems
36575 Mudge Ranch Road
Coarsegold, CA 93614

The line between utter frustration and total addiction is a thin one, and this game rides it well. The game is hard to play but you can improve a little with every game. Aliens swoop down at your ship from the top of the screen, and each wave has its own character, its own "look."

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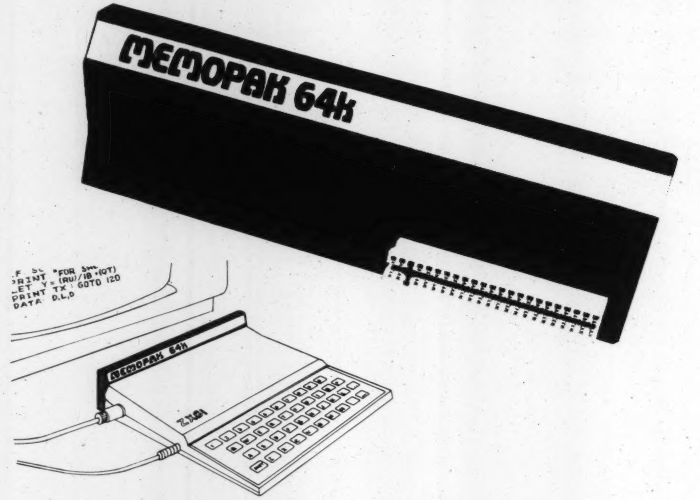

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Fun in Games, continued...

Some fly in jittery formation, others billow like a flag in the breeze. Your natural inclination to gape at them will prove fatal unless curbed. Discipline is called for in order to concentrate not on their grotesque beauty, but rather on their ability to destroy.

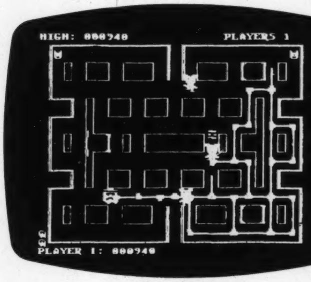
If you manage to survive a number of successive waves, you dock with the mother ship, which is rendered with the humor of a Saul Steinberg cartoon. Here you are refueled while a new set of nefarious alien waves are read from the disk. I have managed to live through two sets so far, and have yet to reach "the last wave." The documentation promises that when you get there, you'll know it.

You can choose to play with or without a moving star background (which makes it much harder to see enemy fire). You can also choose a horrific advanced level.

Threshold will obsess you for some time. Because the aliens change throughout the game, you're primed to withstand at least "one more wave *this* time." Though my wife abhors "shoot-'em-ups," even she spent a while with this one. After quite some time, I still have no reservations about *Threshold*.

Mouskattack

Mouskattack is a maze game that has a personality all its own. It moves beyond John Harris's earlier creation, *Jaw Breaker*, which set a standard for quality in Atari game animation. If maze games appeal to you, so will *Mouskattack*.



Mouskattack.

The game has several unique facets. Rather than "eating" as you traverse the maze, you are a plumber, laying pipe as you go. You are zealously pursued by a group of multi-colored rodents whose goal is to snuff you out. They have you on the run, so even after you have traversed the entire maze, some of the pipes may need to be reworked. Your only assistance in the completion of this task consists of a couple of traps, which don't hold rats for too long, and a couple of cats, who are too scared to do much more than discourage them a bit.

creative computing

SOFTWARE PROFILE

Name: Mouskattack

Type: Arcade

System: Atari 400/800 32K

Format: Disk

Language: Machine

Summary: Another maze game, but can make your nose twitch

Price: $39.95

Manufacturer:
On-Line Systems
36575 Mudge Ranch Road
Coarsegold, CA 93614

Mouskattack is *tough*. I don't care how experienced you are at any other kind of maze game—this one will pose a challenge. In fact, familiarity with other maze games may actually be a handicap! *Mouskattack* requires an entirely fresh approach.

The ultimately disappointing thing about many maze games is that the player can master rote winning patterns. Because the "enemy" follows the same patterns every game, routes can be learned which will work each and every time to avoid confrontation. In *Jaw Breaker*, Harris foiled the possibility of rote patterns by making the "enemy" much less predictable. In *Mouskattack*, he provides a new element—strategic opportunity.

Traps and cats can be picked up and moved in the course of your travels through the maze. This capability allows experimentation leading to strategic configurations. This is much more engaging than beating *Pac Man* with maps. The option makes you feel that more is involved than just conditioning and reflex action (though those qualities will certainly help your score).

The animation is very well executed, though lacking the inspiration and sparkle of *Jaw Breaker*. There are some flourishes, however. When you are "tagged" by a rat you drop down the screen like a leaf in a fall breeze. Every so often a "super rat" appears (easy to spot—watch for the "S" on its chest). Super rats will eat your cats right out from under you, so you must act fast when you spot one. The music in *Mouskattack* is quite well done, but begins to seem a little long after 10 or 20 airings. It is compulsory, and so loses its appeal in short order.

Still, *Mouskattack* has a lot of staying power as a maze game. In addition to offering strategic potential, it offers a simultaneous two player game, wherein you play against rodent and opponent at the same time. Squeaking good fun! ☐

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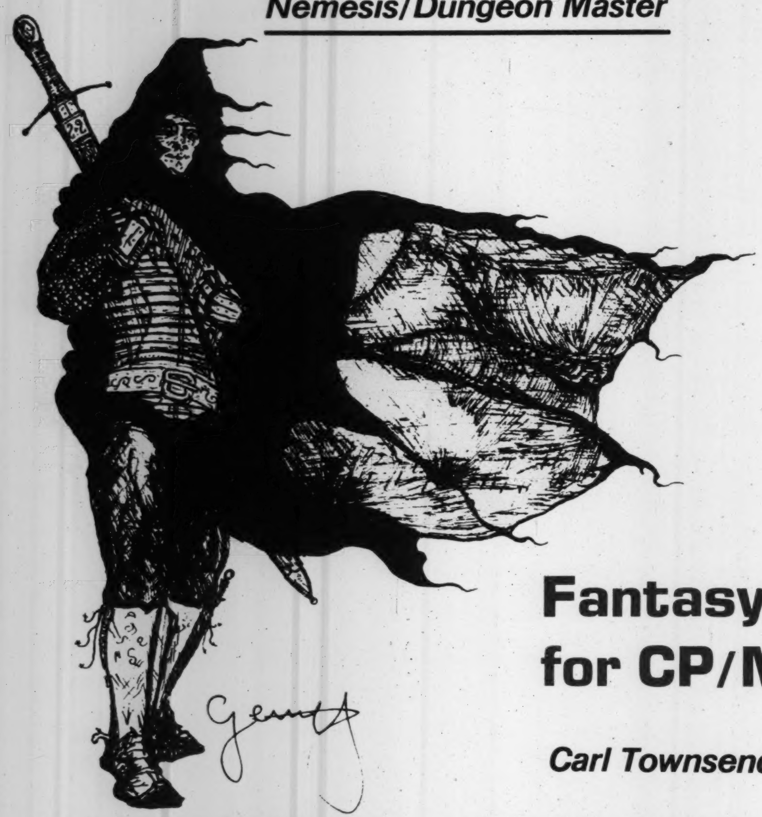
Nemesis/Dungeon Master

creative computing software evaluation

Fantasy Role Playing for CP/M

Carl Townsend



creative computing
SOFTWARE PROFILE

Name: Nemesis/Dungeon Master
Type: Fantasy role playing
System: CP/M 46K
Format: 8" soft sector and others
Summary: Complex and exciting
Price: Nemesis, $40;
Dungeon Master, $35
Manufacturer:
Supersoft
P.O. Box 1628
Champaign, IL 61820

The *Nemesis/Dungeon Master* system is an adventure type game that provides a complexity and excitement rarely seen in CP/M games. If the *Nemesis* module is purchased alone, a variety of characters created by the user can explore up to ten levels of a complex dungeon that is provided with the game.

The maze at each level is a 22 x 26 cell matrix. The *Dungeon Master* is a separate module that permits the user to become the dungeon master, creating additional dungeons with new objects and monsters.

The *Nemesis/Dungeon Master* system consists of four programs:

TERMDEF is the first program called and defines the user system. The game also contains a real-time clock (more on this later), and TERMDEF sets the speed of this clock which controls the speed and difficulty of the game.

> **An ogre has lots of strength for those dungeon doors, but is low in intelligence and wisdom.**

PERSON is then called to create a character for the game. Only one character can be taken into the dungeon at a time.

NEMESIS is the primary game module, and can call either of two overlays. One is the CASTLE program, the second is the DUNGEON program (see Figure 1).

DM is an optional program that permits the player to become the dungeon master, creating new and unusual dungeons with a variety of objects and monsters.

There are five types of data files used by the programs:

TERMDEF: Contains the terminal definition.

YYYYYYYY.CHR: Contains the character information for a particular character, where "YYYYYYYY" is the character name. Created by PERSON and updated by NEMESIS.

XXXXXXXX.N: Where "XXXXXXXX" is the dungeon name and N a number. Contains the dungeon information for each level, where "N" is the level. Created by DM and used by NEMESIS. CASTLE.O contains the castle information.

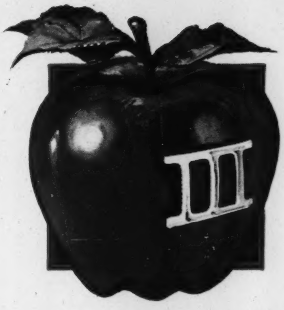
MONSTERS.N: (DM only) Used by DM to create dungeon levels. Contains monster information. "N" refers to the monster characteristics for level N.

ITEMS.N: (DM only) Used by DM to create dungeon levels. Contains the item characteristics for level N.

Both the item and monster files are standard ASCII files and can be altered or updated with any standard text editor.

The *Nemesis* game contains a dungeon called LEVEL that is already created with ten levels, including monsters and items on each level. This will keep any player busy until he gets the itch to try creating his own dungeon. For that he will need DM.

Carl Townsend, 4110 N.E. Alameda, Portland, OR 97212



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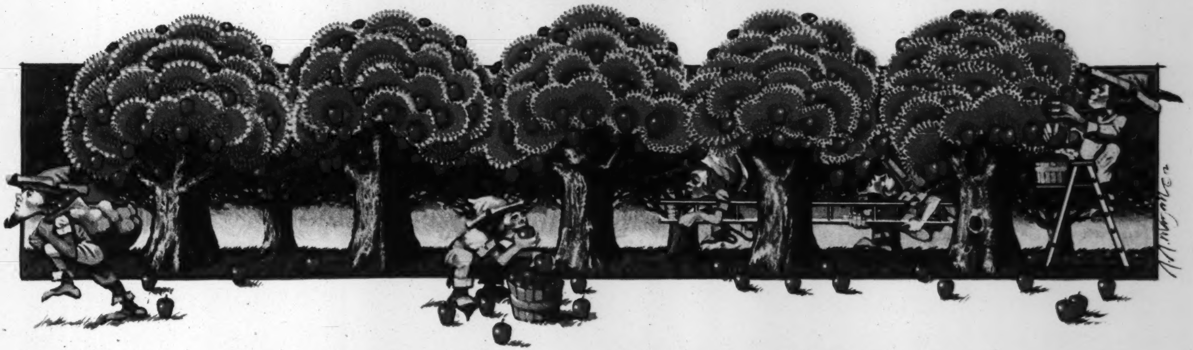

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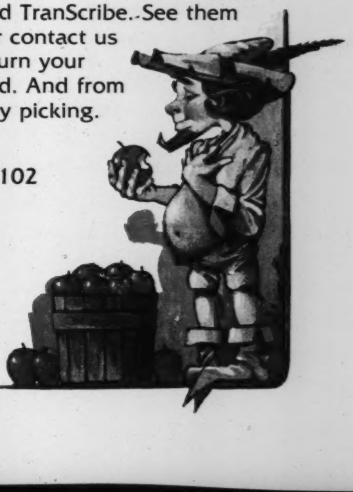

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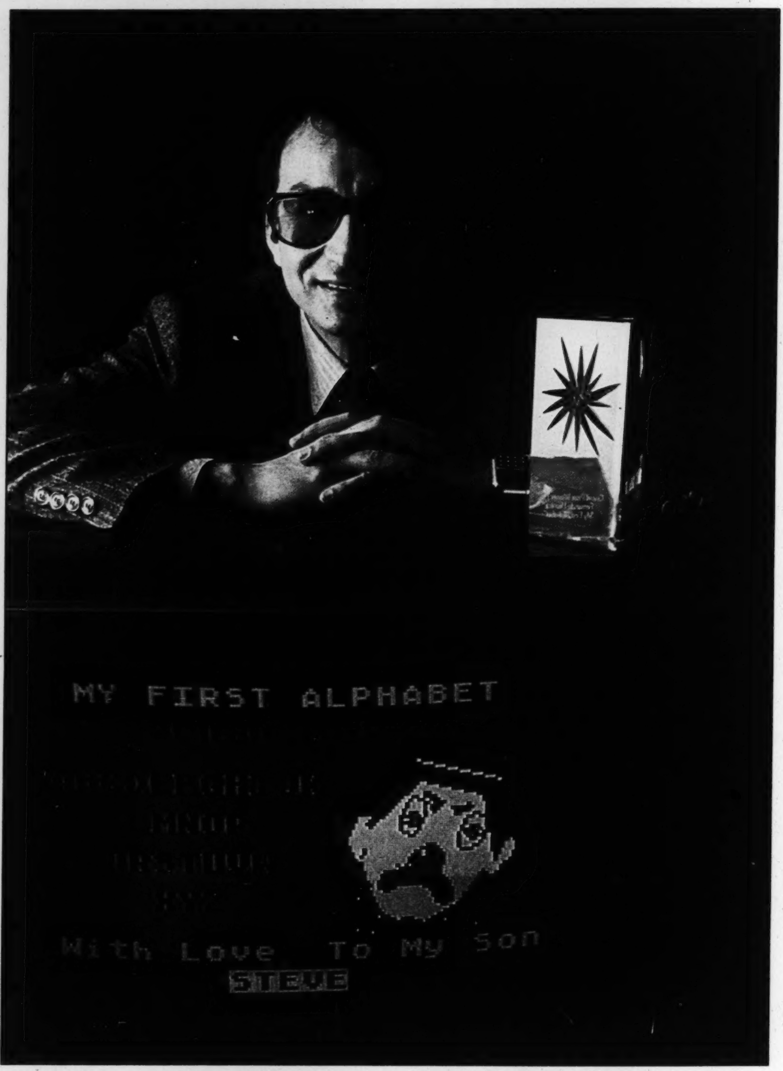


Fernando Herrera became the first grand prize winner of the ATARI Software Acquisition Program (ASAP) competition because he believed in computers, his son and himself.

The story of Herrera's success began with his son's sight problems. Young Steve Herrera had been born with severe cataracts in both eyes and, naturally, his father was concerned. Herrera reasoned that the boy's learning abilities could be seriously affected by growing up in a world he could not see.

Having just purchased an ATARI 800 Home Computer, it occured to Herrera that this could be the perfect tool for testing Steve's vision. So he wrote a program simply displaying the letter "E" in various sizes.

Success! It turned out that 2-year-old Steve could see even the smaller "E's" without special lenses. Herrera was first relieved, and then intrigued when he discovered that not only could his son see the "E's," but he would happily play with the computer-generated letters for hours. So Herrera added a picture of an elephant to go with the "E," and then more letters and pictures. Thus, "My First Alphabet" was born, a unique teaching program for children two-years and older consisting of 36 high resolution pictures of letters and numbers.

Herrera submitted the program to the ATARI Program Exchange, where it became an instant best-seller. ATARI was so impressed with the outstanding design, suitability and graphic appeal of "My First Alphabet," that the program is being incorporated into the ATARI line of software.

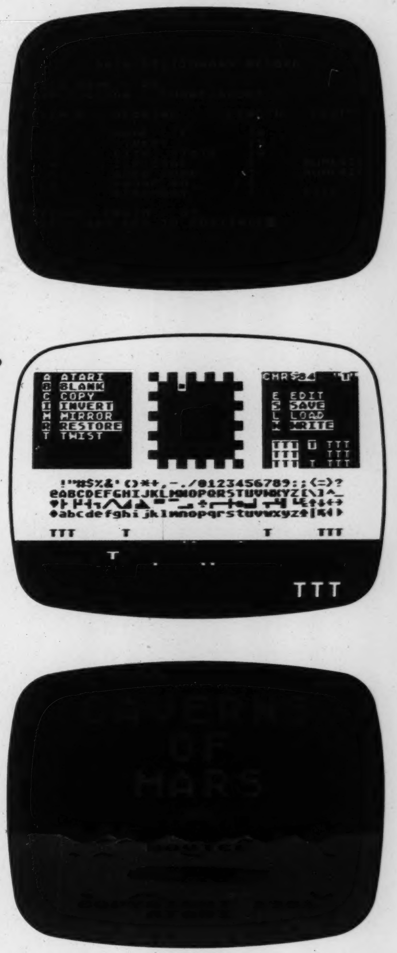
In addition to his grand prize winnings of $25,000 in cash and an ATARI STAR trophy, Herrera also automatically receives royalties from sales of his program through the ATARI Program Exchange.

But Fernando Herrera wasn't the only software "star" that ATARI discovered. Three other ATARI STARS were awarded at the ASAP awards ceremony for software submitted to the ATARI Program Exchange and judged by ATARI to be particularly unique and outstanding.

Ron and Lynn Marcuse of Freehold, New Jersey, teamed up to write three winning entries in the Business and Professional category for home computers: "Data Management System," "The Diskette Librarian" and "The Weekly Planner."

Sheldon Leeman of Oak Park, Michigan, captured an ATARI STAR for his exceptionally well-engineered "INSTEDIT" character set editor.

Greg Christensen of Anaheim, California, became our youngest ATARI STAR winner at the age of 17. Christensen designed the clever "Caverns of Mars" game program, which also will be incorporated into the ATARI product line. Greg designed the program in 1½ months after owning his ATARI Home Computer for less than a year.



Every three months, ATARI awards ATARI STARS to the writers of software programs submitted to the ATARI Software Acquisition Program and judged first, second and third place in the following categories: Consumer (including entertainment, personal interest and development); Education; Business and Professional programs for the home (personal finance and record keeping); and System Software.

Quarterly prizes consist of selected ATARI products worth up to $3,000, as well as an ATARI STAR, plus royalties from program sales through the ATARI Program Exchange. The annual grand prize is the coveted ATARI STAR trophy and $25,000 in cash.

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Fernando Herrera had a great idea that made him a star. ATARI would like to give you the same opportunity.

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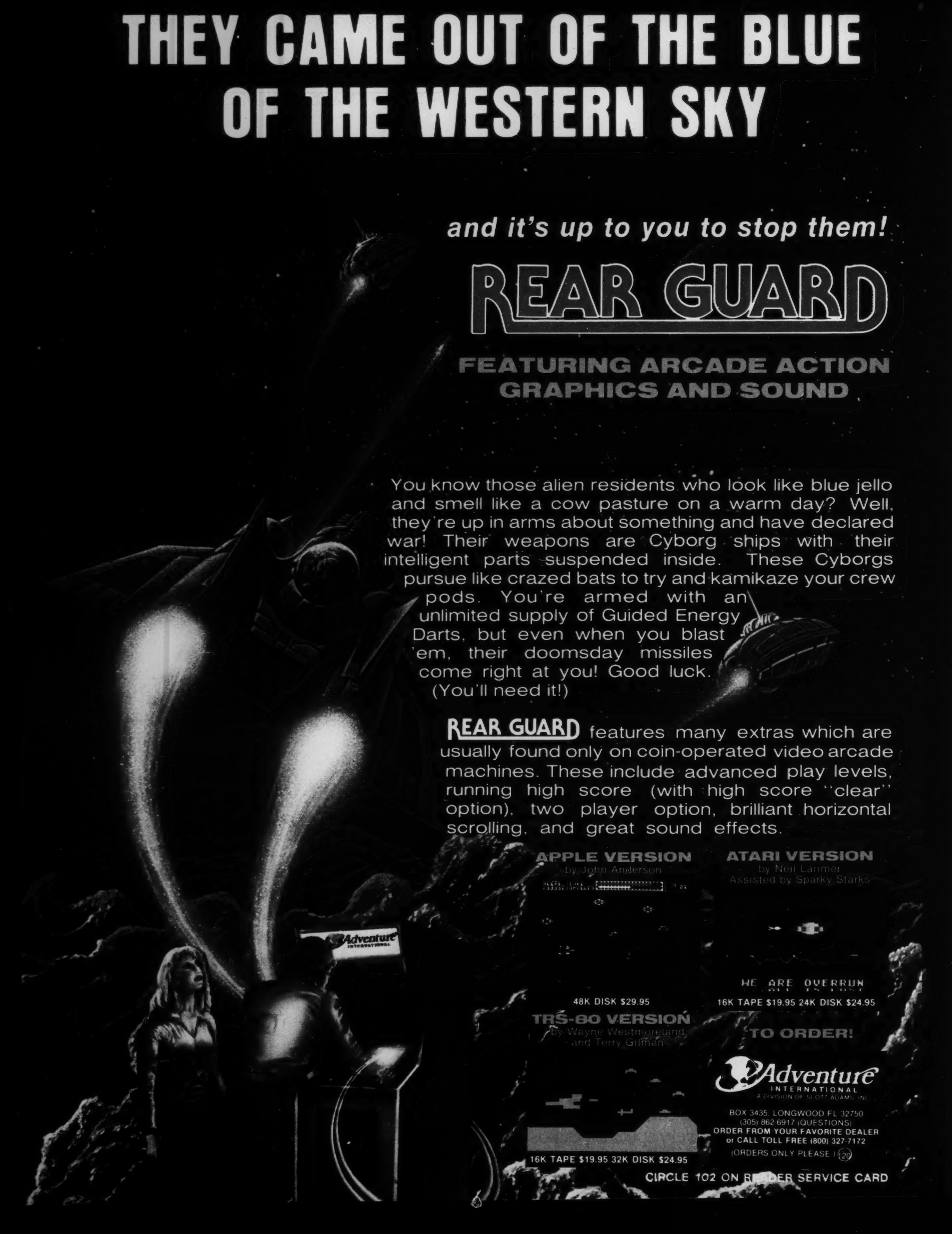

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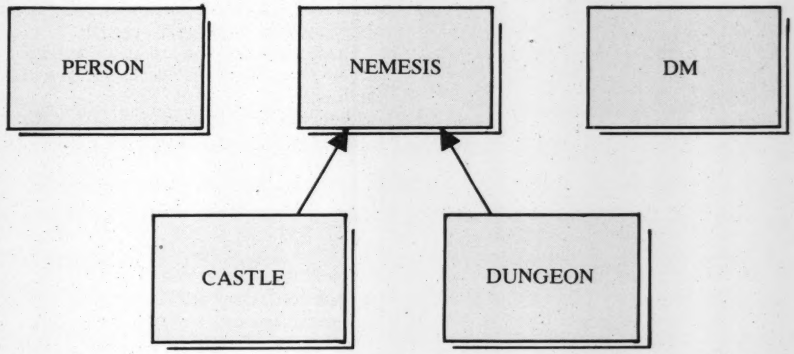
Figure 1. Nemesis Block Diagram.



As with any fantasy role playing game, the dungeon has various levels; monsters have assignment levels and the characters have a level based on their own experience. Going too deep too fast is dangerous.

The entire game was originally written in the C language. The source is not supplied, but is much longer than the C compiler. This will give you some idea of the complexity and possibilities of the game.

Setup

The user must first call TERMDEF to set up the system for a particular terminal and clock speed. Seventeen terminal types are available from a menu. If yours doesn't match any of these, you can input your own terminal definition. The user can use either the CP/M BIOS for I/O or create his own I/O control. An editing option is provided to profile terminal protocol to the program.

The real-time clock speed is also set by TERMDEF. NEMESIS is driven by a real-time clock. A player cannot sit around in the dungeon to read his maps. Monsters are constantly moving and danger exists as long as the player is in the dungeon.

This option in TERMDEF sets the rate and difficulty of the game. If the game is set too fast, you won't survive the first level. If it is set too slow, long periods pass without action. You can experiment with this number to find the best value for your skill level, and it can be changed at any time. The game will run just as fast as an arcade game if you wish and drive you just as crazy.

Creating Characters

PERSON must be run before a game is started to create the desired character. Only one character can be taken into the dungeon at a time. Character generation is started by typing PERSON. This will be the CHR file needed for playing.

On starting PERSON, the user is first requested to enter any character. The time delay until entry is used to initialize the random number generator. The character's name is then requested and entered by the user.

The user can then select any of 15 types (Figure 2). The type selected will affect the statistics generated later by the roller for the characters.

A hobbit, for example, is not too strong or intelligent, but has a better than average constitution, is fast, and has more charisma than many other characters.

An ogre has lots of strength for those dungeon doors, but is low in intelligence and wisdom. The table of weighting factors for each type is included with the game.

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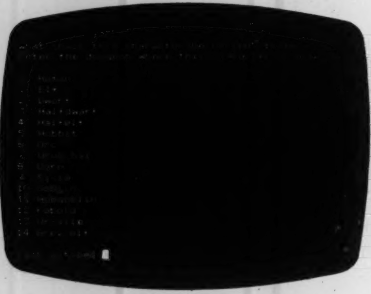
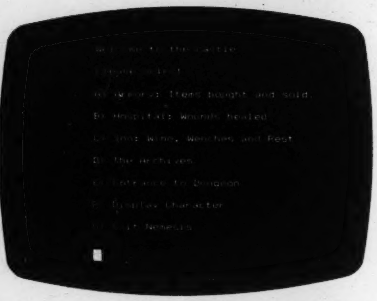


Figure 2. Person Types.



```
Welcome to the castle

A) Armory: Items bought and sold.

B) Hospital: Wounds healed

C) Inn: Wine, Wenches and Rest

D) The Archives

E) Entrance to Dungeon

F) Display Character

G) Quit Nemesis
```

Figure 3. Entering the Game at the Castle.

The archives is the place to go to determine if an object has magical properties.

PERSON then enters the "roller" and generates seven characteristics for the character: sex, intelligence (useful for exploring the usefulness of an item), strength (needed to open doors and to fight), wisdom, charisma, constitution (how well the character can hold out in attacking), dexterity (speed in attacking and duration of spells), and money for purchasing items in the castle.

These values are determined by rolling four five-sided dice and weighing the values obtained by various bonus values for the different character types. They can vary from 1 to 16.

The user can either select the values displayed by entering a Y, or hit a carriage return to generate another set of statistics for the character. In this way the user can create weak and strong characters as desired.

If the character has a strength of only 2, for example, don't expect him to be able to open a closed door on the deeper levels. If dexterity is low, don't expect spells to last very long or to be very strong.

The character alignment is then selected. This can be any of three values: lawful, neutral, or chaotic.

You can create good, neutral, or evil characters. From these statistics PERSON determines 15 permissible occupations for the character (Table 1) and displays them. The user then selects one of these occupations.

The range of selection depends upon the set of characteristics selected earlier, the character alignment, and class. The more powerful occupations (as the Paladin) will seldom be available unless you spend a long time at the random number generator. It is also challenging to create a very weak character (as a peasant girl) and try to get beyond the first level safely.

Exploring the Dungeon

Nemesis is then called with the character name as:

```
A > NEMESIS BILBO
```

A character input is then requested (to seed the random number generator) and the game begins.

The character starts in the castle, the only safe place in the game. No monsters can attack a character in the castle. The castle menu has seven options (see Figure 3).

The Armory is a good place to purchase or sell a variety of objects if you have the money. You probably won't have enough gold to purchase even a hanky at the start; but you can go there later to sell unused items when you find yourself overloaded. Be careful, however. Some items have magic properties, and are not always as they seem.

The hospital and inn are good places to rest and recover from fierce battles with the monsters.

Every character has a certain HIT level that determines how wounded or viable he is. The level drops during battles, and when it reaches zero, the character is dead.

The archives is the place to go to determine if an object has magical properties. This information will cost you some of your gold, however. The amount you must pay differs with a number of variables, including the quality of the magic, and since the amount required is not revealed in advance the process is always a gamble.

The more magical the item, the greater the gamble. If your character has sufficient intelligence, you may be able to figure out the magic properties on your own without using the achives. In some cases, however, you can destroy the magical properties by so doing.

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Table 1. Occupation Types Available (Class).

R	Move one room right
L	Move one room left
U	Move one room up
D	Move one room down
ESC	Display character
M	Throw a magic spell
C	Throw a cleric spell
E	Suspend and save game
H	Print maze
P	Redisplay maze

Table 2. Movement Control.

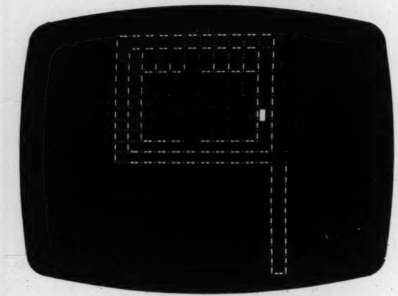
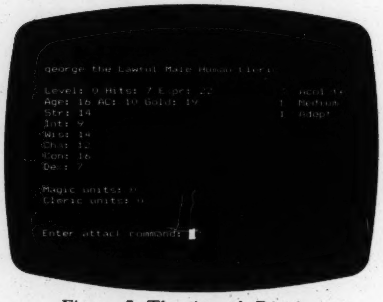


Figure 4. Wandering in the Maze.



```
george the Lawful Male Human Cleric

Level: 0 Hits: 7 Expr: 22                [illegible] Acolyte
Age: 16 AC: 10 Gold: 19                   1  Medium
Str: 14                                   1  Adept
Int: 9
Wis: 14
Cha: 12
Con: 16
Dex: 7

Magic units: 0
Cleric units: 0


Enter attack command: █
```

Figure 5. The Attack Display.

On entering the dungeon, you find yourself on level 0. The dungeon level is unexplored, so nothing of that level is visible. As the character moves, the layout of the level unfolds (see Figure 4).

There are solid walls, normal doors, magic doors, and hallways. The keys R, L, U, and D move the character right, left, up, and down. Other keys have other functions (see Table 2). The M and C keys work only if you have spell capability and your spells aren't depleted. The H key saves the maze to a file for printing purposes.

Some areas of the dungeon level may be more monster-prone than others.

You can display your character's current characteristics, including level, hits, experience, age, armor class, gold, characteristics, and spell units at any time.

The character has a level assignment based on experience. The dungeon also has a variety of levels, and both monsters and objects have level assignments. If the character has a high level assignment, this means he is better able to survive the deeper (and higher) levels of the dungeon and can deal with the high-level monsters on those levels.

The armor class varies from 10 (bare skin) on down. As the character finds shields, helmets, leathers, etc. and "uses" them, the armor class drops to reflect this, and his survival probability in battle increases.

A variety of dangers lurk in the dungeon. Pits can be dangerous and reduce the character's hit level. Up to three staircases, which may end more than one level away, can be on any level. Chutes also exist and are only one-way. If you fall down a chute, you must find a stairway to get back up. Some areas are so dark that light spells cannot penetrate. Transporters can move you about the maze in a random way, and flames can be found in some dungeon areas.

Attacks and Fights

As long as a character is in the dungeon, he is vulnerable to attacks from a wide variety of monsters. Even if you are not moving, you are vulnerable. Whenever a monster attacks, the display changes to the attack display (see Figure 5). The attacking creature(s) is shown in the upper right. Your character's statistics are shown in the upper left. It is possible that more than one monster or a group of monsters will be displayed.

As the I/O is done asynchronously, if you wait too long to attack you will be in big trouble. To start the battle, you enter F. This permits you to swing at the monster with whatever weapon you are carrying. If you have spells, you can use these instead of fighting. If you are successful (the damage you did was great enough), the monster will vanish from the list in the upper right. If not, you must try again. When all the monsters have been killed, your dungeon map will be displayed again.

If you take too long to kill the monster or your character is too weak, you will see your hit level drop as you fight. If your hit level reaches zero, you are informed of your death and the game is over. If you are successful in the battle but are left with a low hit level, you should return to the castle for rest.

Some areas of the dungeon level may be more monster-prone than others. Battles increase your experience level, so when you find such an area you can quickly move through many battles and gain enough experience to move to a deeper level.

Treasures

As you move through the dungeon, you find a variety of items. A description of each item is displayed at the top of the screen. You must decide whether to pick it up or not. In some cases you may find

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Light	2	Travel
Damage	4	Attack
Sleep	4	Attack
Shield	6	Travel
Strength	8	Travel
Fireball	10	Attack
Lightning	10	Attack
Disclose	10	Travel
Speed	14	Travel
Levitate	16	Travel
Fear	15	Attack
Cloudkill	20	Attack
Power Word	25	Attack

Table 3. Magic Spells Available.

Light	2	Travel
Cure	4	Travel
Damage	4	Attack
Protect	8	Travel
Heal	8	Travel
Restore	10	Travel
Attack	10	Attack
Dispell	10	Attack
Disclose	10	Travel
Holy Word	20	Attack
Silence	15	Travel

Table 4. Cleric Spells Available.

yourself overloaded and must drop a few items or sell them at the armory.

All items are not usable by all classes. After you have obtained an item, you can move to the character statistics display and request to use it (U). If usable, it will be marked with a "+," and the statistics display may change.

To discover if an item has magical properties, you must have used it twice and you must go to the archives and pay some gold. Another way to discover magic properties is to inspect the object ("I" from the statistics display) and, if your character's intelligence is high enough, you may learn something. This, however, is a dangerous practice as you may destroy the object.

Spells

In Tables 3 and 4 are listings of spells available to magicians and clerics. The spells are of two types: attack and travel. Travel type spells cannot be used in battle. Spell strength and duration vary with the character's characteristics; spell units are gained as the character gains experience, and cannot be used at the beginning of the game. Available spell units are displayed with the character's characteristics.

Creating Dungeons

If you want to create your own dungeons, *Dungeon Master* enables you to be a dungeon master. Like *Nemesis*, it includes a terminal definition program. It also contains a PERSON program that replaces the PERSON of *Nemesis*. The reason for this is that whenever a character is created, it must be created for a particular dungeon.

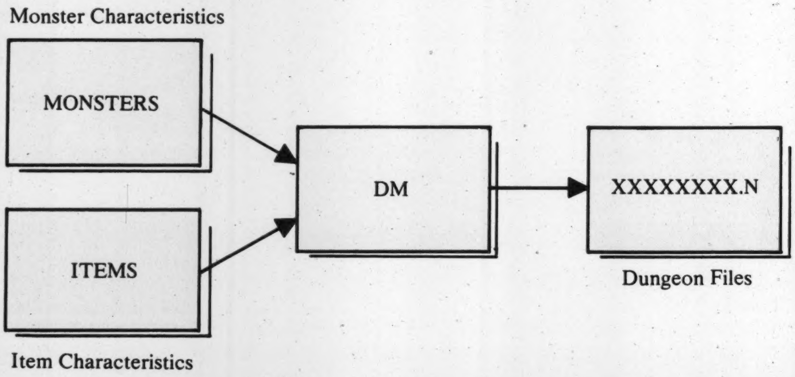
Dungeon Master, or DM, includes a collection of data files. One set, the MONSTER data files, contains the monster for a given level. Another set, the ITEM data files, contains the items to be found at any particular level.

The data files are used as input to the *Dungeon Master* to create a collection of dungeon data files; one for each level (see Figure 6). An editor in *Dungeon Master* is used to draw the mazes and place the doors, magic doors, stairs and chutes, and to add specific features to the cells.

Summary

I have found *Nemesis* to be one of the most exciting games available for CP/M systems. Every game is different, and the wide variety of characters and features makes the game continuously exciting. □

Figure 6. Dungeon Creation.



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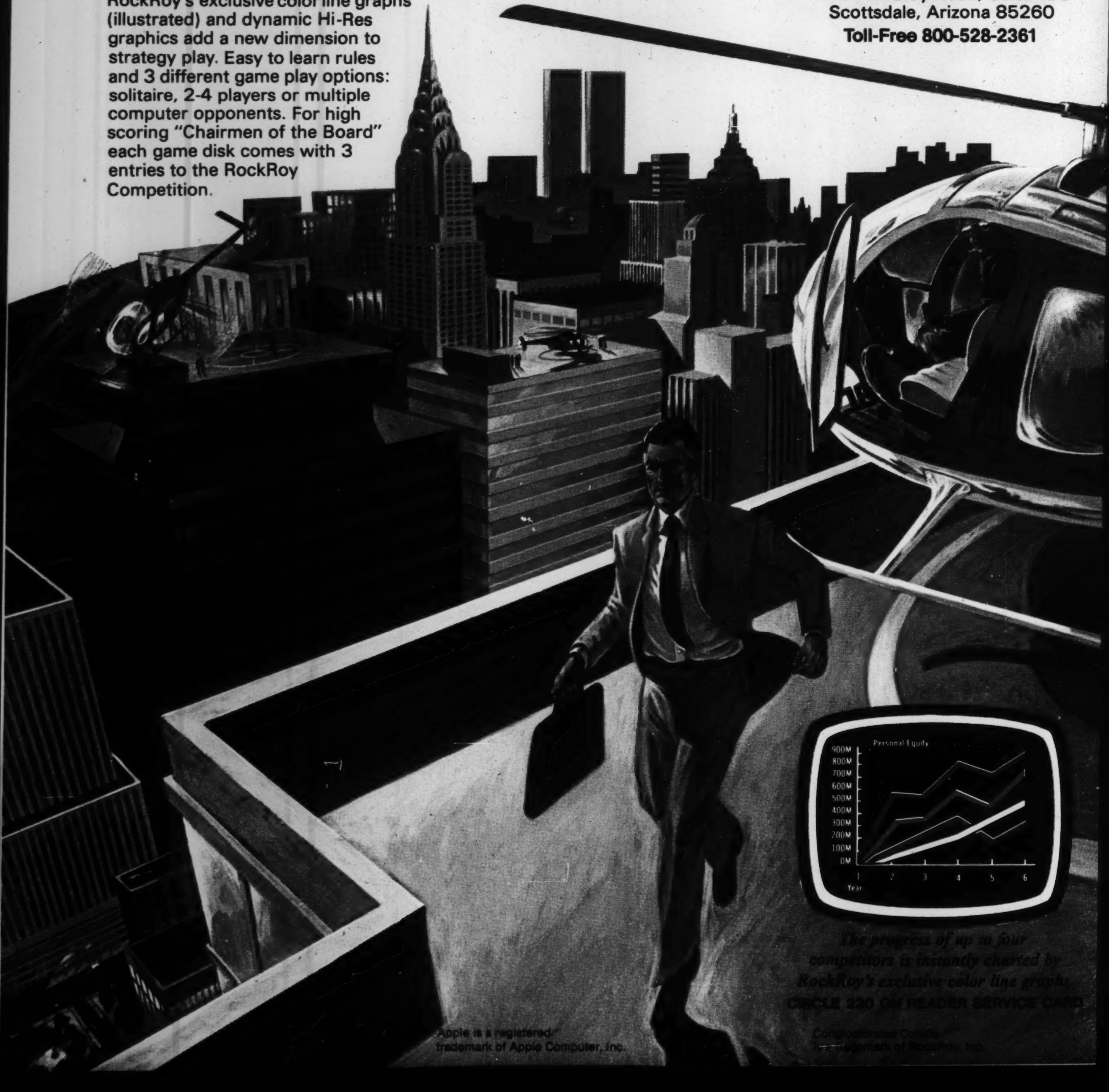

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Graphic Adventures on the Atari Worth a Thousand Words?

John Anderson

Adventure games, an established and popular genre among microcomputer enthusiasts, are generally divided into two categories: text adventures and graphics adventures. This dichotomy seems clear enough: a text adventure uses words alone, similar to books or radio plays, to create a picture in the mind. A graphic adventure, in contrast, draws these pictures for the eye. Each category claims its own adherents.

Text adventure aficionados assert that only verbal descriptions can provide a satisfactorily rich level of story telling, as they leave most of the visualization to imagination. For these people, a good adventure is like a good book—a reading experience.

Graphic adventure chauvinists point out correctly that text adventures employ a very static screen display. This is wasteful, they argue, in light of the capabilities of microcomputers. Graphics potential (and sound potential, for that matter), should not be left unexploited by the adventure program. Each faction has a well-taken point.

The fact is, however, that the division between text adventures and graphic adventures is not nearly as sharp as this, and some of the most interesting developments in microgames are taking place between the two poles. All graphics adventures employ text to one degree or another—either to augment the graphic display or as the basis for graphic augmentation. Let's examine these approaches more closely.

One method of constructing graphic adventures might be called the *illustrated text adventure*. This employs all the normal conventions of a text adventure, including text command input, though the text may be less descriptive and more to the point. In addition to this, the player is provided with an illustration of his or her current position via a high resolution picture. These are stored on disk and are called out as necessary by the main, text-oriented program.

Text adventure aficionados assert that only verbal descriptions can provide a satisfactorily rich level of story telling.

The simile is close to the idea of a comic book. Each piece of the story has its own "frame" of picture and text. The point of view is that of the central character—the player sees the locations as if he were there.

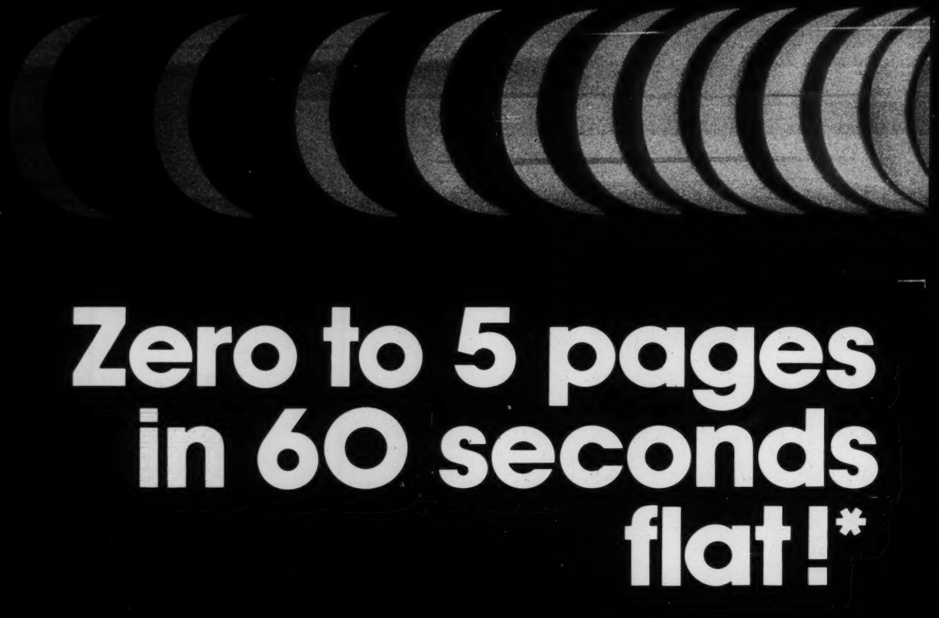
Another approach results in the *mapped adventure*, wherein the player or players appear as symbols on a map. This map depicts the details of the location, indicating the type and placement of terrain, walls, objects, and enemies, among other things. Player movement is input through keyboard or joystick. As a character reaches the border of a screen map in any direction, either the screen begins to scroll in that direction, or a new location map is drawn. This creates a more omniscient perspective, with the player looking down on his character's movement from above.

Typically this type of adventure does not allow text input, but limits the player to a certain number of possible contingencies in a menu or command format. The comparison between text adventures and mapped adventures is close to that of a fill-in-the-blank vs. a multiple-choice test.

Text adventure enthusiasts feel the menu format is restrictive—one can only choose to move or stand still, flee or fight, take or drop, and so on. The mapped adventure began as an outgrowth of a certain fantasy role-playing game whose name we are not permitted to print. One obvious advantage of this format is the capability for multicharacter play.

Until quite recently, the preference boiled down to a choice between the classic-style text adventure game and the fantasy role-playing adventure. However, hybrids are now being developed that now provide both types of enjoyment.

Truly hybrid adventure games of the future will offer the best aspects of all approaches to computer gaming. Textual description will provide detailed background and help set the mood. Maps will be available to indicate position (except in areas still unexplored). Computer graphics and sound will be called on where appropriate to animate action sequences.



Adventures, continued...

Arcade-style challenges will become part of the stories, calling for feats of coordination before the plot advances. And it won't be too long before the videodisc becomes a necessary peripheral for state-of-the-art adventuring.

This is still a ways off in the future. That is quite enough background, however, to examine the spectrum of graphic adventure software currently available for the Atari.

Mission: Asteroid

In the arcade game *Asteroids*, you use hand-eye coordination to zap as many asteroids as possible in the few minutes you are allotted. In *Mission: Asteroid*, your job is to destroy just one asteroid, and you have several hours in which to do it. The game allows you to input two-word commands, and displays a high resolution picture for every location, with a four-line text window at the bottom of the screen. Pressing return without entering text will kill the picture momentarily, giving you a chance to recall the last 24 lines of the text that have scrolled by. Tap return again and the picture will reappear.

The plot line of *Mission: Asteroid* is pretty easy to follow; it was designed as an introduction to a series of "Hi-Res Adventures" of much greater complexity. That is not to say that the game is easy to solve—it's not.

> ***The first thing the novice should do is turn the "monster recurrence" level down to zero.***

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SOFTWARE PROFILE

Name: Mission: Asteroid (Hi-Res Adventure #0)

Type: Space Adventure

System: 40K Atari 400/800

Format: Disk

Language: Machine

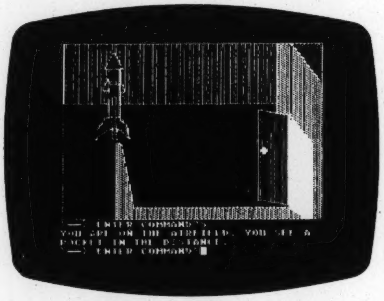
Summary: Introduction to a series of graphic adventures

Price: $24.95

Manufacturer:
On-Line Systems
36574 Mudge Ranch Road
Coarsegold, CA 93614

Briefly described, you are an astronaut, who is sent into deep space to destroy an asteroid headed toward earth. You have only a limited amount of time before the asteroid collides with earth and the game is over.

It is interesting to gauge the reactions of text adventure buffs to the over 100 pictures on the disk. Some enjoy them thoroughly, others use them as mnemonic devices, which eliminate the necessity to map the adventure on paper. Still others find the pictures a questionable, if not downright distracting, addition. The pic-



```
——> ENTER COMMAND?
YOU ARE ON THE AIRFIELD. YOU SEE A
ROCKET IN THE DISTANCE.
——> ENTER COMMAND?█
```

Mission: Asteroid.

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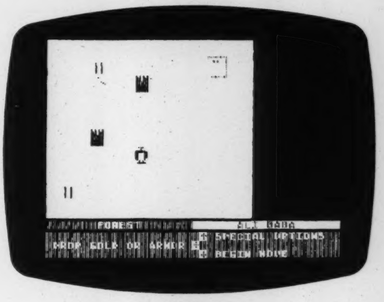
tures are well-done—obviously a lot of time was spent executing them. They are pretty, but they do not achieve even the quality of a well-drawn comic book. This leaves me a little dissatisfied. I think it is fair to ask of any graphic adventure game: How well would the adventure stand on its own, if we were to delete all the pictures?

In the case of *Mission: Asteroid*, the plot line is kept intentionally simple, as it is intended to be an introduction to a series of graphic adventures, and it is an enjoyable program. As such, it would not be really entertaining without the pictures. The graphics serve to enhance the overall effect, but are unable to enrich the story significantly. In the intricate and involving stories of other adventures in the series, they stand a better chance of achieving this goal. I am certainly among those who feel illustrations can improve text adventures.

Apparently so is Scott Adams, who is in the process of re-releasing all twelve of his now-classic adventures as illustrated text adventures.

Ali Baba

Ali Baba and the Forty Thieves attempts to move beyond the illustrated text adventure. It was designed for the Atari, in contrast to *Mission: Asteroid*, which is an Apple translation. The game makes use of some of the special features of the Atari, such as multi-channel sound. It is an example of a mapped adventure, wherein players are depicted on a multi-colored map. As the players move to new locations, new areas of the map are displayed.



Ali Baba.

When you first sit down with *Ali Baba*, you may not get up for several hours. The game shows strong potential when you see it for the first time. It allows for a total of 17 characters to participate simultaneously in a search to rescue a kidnapped princess.

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SOFTWARE PROFILE

Name: Ali Baba and the Forty Thieves

Type: Mapped-style graphic adventure

System: 32K Atari 400/800

Format: Disk

Language: Machine

Summary: A fantasy role-playing adventure with some new ideas

Price: $32.95

Manufacturer:
Quality Software
6660 Reseda, Suite 105
Reseda, CA 91335

This adventure leans heavily in the direction of a fantasy role-playing game, assigning weights to the attributes of each character.

From my experience, this makes for a much more lively game when friends are sitting in. Instead of everyone in the room discussing what the sole character in a text adventure should do, everyone can be his own character, interacting within

Adventures, continued...

the adventure as well as with each other. The discussion takes on new depth as individuals decide what course to take for themselves.

In *Ali Baba* you can choose to become one of the set of humans, elves, halflings or dwarves that are profiled in the extensive documentation that accompanies the game. Each of these sets of beings is represented by a different symbol on the screen. Using the keyboard or joysticks to input movement, players can explore the caverns, palaces, passages, and treasure rooms of the game—and happen upon the dangerous inhabitants therein.

The game is immediately addictive, and is really tough. The first thing the novice should do is turn the "monster recurrence" level down to zero. This will keep him from becoming utterly bogged down in fending off attackers.

You'll spend hours wandering around, acquiring treasures, buying weapons and armor, fighting enemies and thieves, and searching for the princess. Characters can be reincarnated if they are snuffed out, and reinforcements can be called in when the going gets really heavy.

Mastery requires the acquisition of some formidable skills.

As in other role-playing games, each character has unique attributes. Elves are fast and hard to hit; dwarves are slow and clumsy but when they connect they pack a heavy blow. This richness of character is the strong point of the game.

The adventure has some other interesting features. It can be configured to play through nested menus, controlled completely by one or more joysticks, eliminating keyboard entry completely. Characters can be retired as well as reincarnated, and in fact Ali himself can be retired if no one wishes to take his role. Characters other than players wander through the game, and will sometimes attack each other, allowing players to make a fast getaway. The map graphics, Arabic-style typeface, music, and sound effects are quite good.

The problem with *Ali Baba* is the way it ends. After much exploration and fighting, you will discover the princess, and fight valiantly to return her to the king. When you manage to do so, the king thanks you, gives you some gold, and invites you to go back to amass more treasure. And that's it. It's a rather sudden let down, and it leaves players without the feeling they have mastered a difficult puzzle.

The documentation states that Ali Baba, himself a relatively weak, slow, and unskilled character in the adventure, can reach and rescue the princess unaided, and without once raising his sword to fight. As it still seems impossible to me after several hours of trying, this poses the challenge of a real puzzle. Realizing how much more fun it is to play this type of game with other people, I think it's a shame that the challenge evaporates so quickly in the multiplayer game.

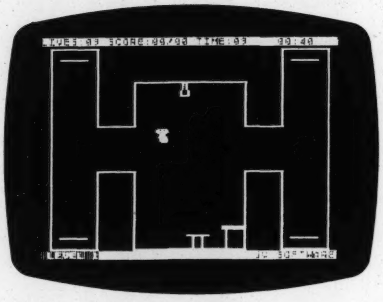
Still, fans of role-playing games may really enjoy *Ali Baba*. It employs some nice concepts in its execution. For those protracted sessions, multiple games can be saved to disk.

Action Quest

Purist adventurers who feel arcade games are beneath them may wince at the inclusion of *Action Quest* in an article on adventure games. It is, in fact, a rather radical departure from the format of traditional adventure games. *Action Quest*, despite the uninspired title, deftly exhibits some of the qualities of the mapped adventure: it draws a map of current location, provides a running status report, and allows character movement to be input by joystick. Pull on the stick, and your character scrolls smoothly across the screen. Head for a portal, and a map of your new room location appears on the screen. But the game transcends the typical adventure from here on in.

Action Quest is a one player arcade-style game within an adventure format—and it is addictive, well-paced, and fun.

The game is divided into five levels of six rooms each. If you complete all the required actions of each room, including gathering treasures, completing obstacle courses and traversing mazes, you may advance to the next, more advanced level of play.



Action Quest.

You encounter numerous monsters, dodge bullets, run through rooms with walls closing in on two sides, and happen upon mystifying puzzles that must be solved. You carry a gun which you aim with the stick (this takes time to master), and while without it you wouldn't last too long, I still would not call this a "shoot-'em-up" type game. You have ten lives, which is not as generous as it sounds, considering the rate at which you expend them.

Each room has a name, which gives a clue concerning what you need to do to get through it. The only problem is that by the time you have read the name for the first time, you may already have been skewered by some bizarre creature.

You play against the clock as well as attempting to get through as many levels of the game as you can. This ensures you may still enjoy the game even after you have completed the adventure. I do not wish to instill the idea, however, that you will get all the way through *Action Quest* in any short amount of time. Mastery requires the acquisition of some formidable skills. At the end of the game your score is tallied, and you are assigned a rating on the basis of time used, lives expended, and treasures amassed.

Perhaps it is a stretch to label *Action Quest* as an adventure game, but it is an exciting move in the right direction. The game is strong in one of the fundamental aspects of computer gaming: building toward a goal.

Though the sound is somewhat unsophisticated, the graphic animation is well-executed. Your character is an undulating ghost, and as remaining in one room for too long can be fatal, it begins to fade slowly when you enter a room. If the ghost disappears completely, it costs you a life. Sometimes you must shuttle between rooms quickly to avoid "suffocating" in this manner.

The author of *Action Quest* has indicated that a sequel with greater challenges, as well as more sophisticated graphics is in the works. I, for one, am looking forward to it. ☐

creative computing
SOFTWARE PROFILE

Name: Action Quest

Type: Arcade/Adventure

System: 16K Atari 400/800

Format: Cassette/disk

Language: Machine

Summary: Unique attempt to merge two types of games

Price: $29.95

Manufacturer:
JV Software
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The Wizard, the Princess, and the Atari

David and Sandy Small

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SOFTWARE PROFILE

Name: The Wizard and the Princess
Type: Adventure game with pictures
System: Atari 800 version
Requires 40K RAM memory
Format: Disk, double sided
Summary: Very good adventure game with graphics
Price: $29.95
Manufacturer:
On-Line Systems
36575 Mudge Rd.
Coarsegold, CA 93614
(209) 683-6858

A copy of *The Wizard and the Princess* for the Atari recently appeared in my mailbox. This happened around Christmas time, and the family was visiting. So I decided to show them the game, and soon the whole Small clan became involved in playing and trying to beat it.

It took us roughly four solid days to do so.

The Wizard and the Princess comes attractively packaged with the disk adequately protected against any but the worst of Post Office Bend-a-Disk equipment. The directions are on the printed folder surrounding the disk and are clear enough. So, you boot the disk without a cartridge, for the game is written entirely in 6502 machine code.

This is its first plus mark. One of the least endearing features of some programs is Atari Basic, one of the slowest executing languages ever developed. *The Wizard and the Princess* runs very quickly and with minimal delay.

Next, you boot the system, and wait for the driver routine to load and for the disk protection scheme to determine that you haven't copied the disk from someone else. Then, you are told to flip the disk and insert the reverse side.

Backup

The data tables, hi-res screens, and all are on the flip side of the disk. The flip side isn't copy protected, and given the amount of time the disk head spends beating on it, it has a good chance of failing, so it should be backed up.

The folks at On-Line have thought of this, and they provide a backup routine. If you boot up off of the back side, you are automatically taken to a backup routine, which will format a new disk and copy itself—very nicely done, very convenient, and very thoughtful.

The disk spends most of its time on the flip side, and is in almost constant use while the game is being played. This is the only slow feature of the game. Atari disks are 1/20th as fast as Apple disks (serial vs. parallel) and it shows, even though attempts have obviously been made to minimize the problem. For example, the *W&P* disk is fast-formatted to allow faster disk access.

Snakes Alive

As we began the game, we wandered out of Selenia northwards in pursuit of the wizard, and immediately ran into a rattlesnake which wouldn't let us by.

Being an old adventurer, I knew I needed something to get by him, but nothing I had on me worked, so I set off south in search of the proper object. Aha, a rock.

I picked up the rock, and died, for the first of many times, after being bitten by the scorpion hiding behind it.

Many hours later the family figured out how to get by the rattlesnake; it is one of the most difficult parts of the game. Fortunately, the authors had included a hint card, labeled "How To Get By The Rattlesnake," which helped considerably. (Naturally, we didn't read it until we were so frustrated we were ready to burn the disk.)

With the aid of a good deal of mapping, we proceeded on our way, picking up everything imaginable.

A hint to players of this game is to LOOK at everything you pick up; some of the most subtle hints are there. We hate to give away any of them, but do be

---

David and Sandy Small, 11314 Yucca Drive, Austin, TX 98750.

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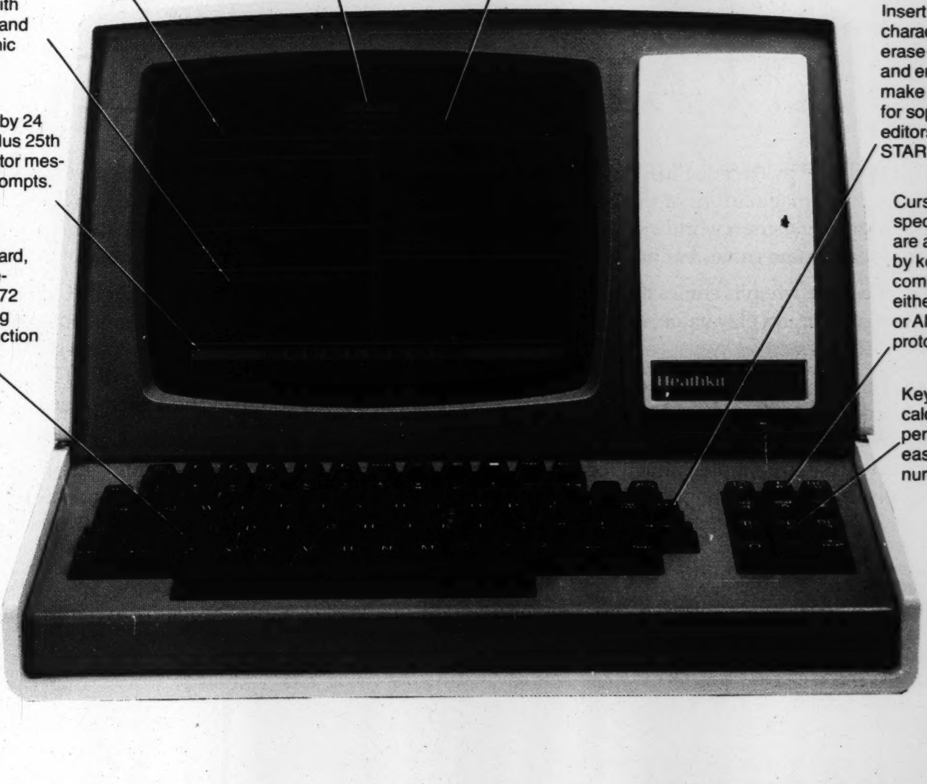

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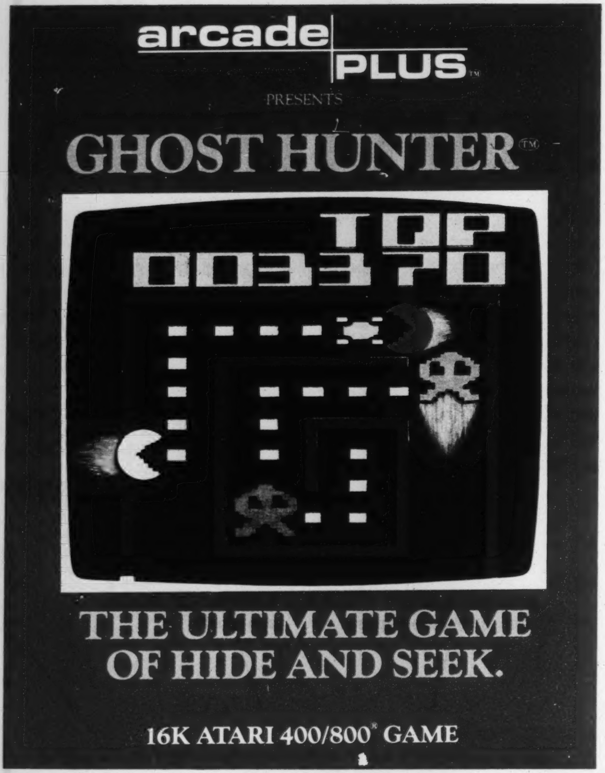

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CIRCLE 110 ON READER SERVICE CARD

Wizard, continued...

sure to LOOK at everything; we wouldn't have gotten stuck in a few places if we had done so.

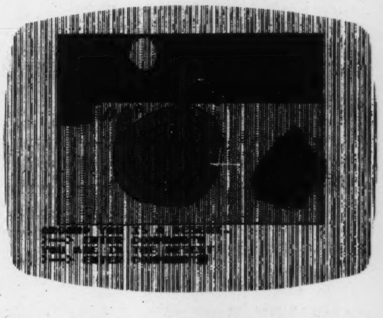
On the way north, we had to cross a bridge, fend off another snake, outsneak a gnome, figure out several magic words, learn how to operate a rowboat (and how to plug the hole in it), find an island, and do many other wonderful things.

In terms of difficulty I would rate *The Wizard and the Princess* right up there with some of Scott Adams's efforts, and the high-res screens add a new dimension that is a great deal of fun (even when everything is green and blue). As I said, it took our family four days, and that's only because there were many people adding new ideas all the time; one person might need weeks to finish this adventure.

Finally, after much mapmaking, meeting of old peasant women, buying peddlers' wares, and dying, we made it to the castle, confronted the wizard, and rescued the princess, bringing her safely back to Selenia.

We are still waiting for our half of the King's land, though.

Features



The hi-res pictures are good, often with good detail on them; the ideas are original, and require some thinking, which is also good; and the implementation is generally good, even if it is bit disk-dependent. There is something to be said for the idea that text-only games force you to use your imagination more than the versions with pictures; we enjoy them both.

There is a very nice "save game" feature which allows you to save the game at any point. You put in a blank disk, and type a letter, A-L, which labels the saved version. At any point thereafter, you can RESTORE GAME to any of the saved versions.

The ability to save multiple versions on one disk is very nice (Scott Adams take note) and we used it a great deal. You can even initialize a new disk from inside the game—a very professional touch.

One Big Complaint

Now for the complaints. I have one major complaint about the game, and it is a very subtle annoyance. Like most minor irritants, however, it builds up over time until it gets to the point where you can't stand it anymore.

Unlike a really gross deficiency in the game, such as an execution error or problem of that sort, this one takes a while to get on your nerves, but its effect is devastating.

The game has a four-line window at the bottom of the screen, in which all displayed text is shown. Often the text won't fit into four lines, so the authors have the machine pause in the middle and wait for a Return

Chameleon Chips: CTIA and GTIA

I was very surprised when the hi-res screens of *The Wizard and The Princess* turned out to consist of shades of four-hours-of-turbulence-in-a-DC-10 Green, Mental Hospital Blue, and you've-just-crashed-the-Atari black. Those were the only colors, although some of them were shaded by interspersing dots with other colors. This was very disappointing. How could it be?

This color business annoyed me a great deal. I have put 128 colors of all sorts of neat red, green, blue, and orange shades onscreen, making full use of the abilities of the Atari, and the authors appeared not even to have tried to take advantage of these same abilities.

The reasons behind the displayed colors are rather complex and worth pursuing, for other games will suffer from the same malady: it is the effect of a new graphics chip on what is known as "artifacting."

In graphics 8, a single dot by itself will appear to be either blue, red, or white, depending on where it is written and its proximity to other dots. (And here you thought graphics 8 was a single color mode, like the book said).

This happens because of "artifacting," which I understand to be the Atari running the TV out of resolution and ending up with a color other than what is normally output. With careful use of graphics 8, one can get four colors in this hi-res mode.

The authors of *The Wizard and the Princess* originally wrote it for the Apple, which has a 280 x 192 screen. So the tables for the hi-res drawings were scaled appropriately. The two highest-resolution modes of the Atari are graphics 7 plus, with 160 x 192, and graphics 8, with 320 x 192. In graphics 7 plus, various colors can be plugged into the color registers; in graphics 8 the colors result from artifacting.

The person who translated this program from the Apple to the Atari had the choice of scaling down all the tables to 160 x 192 and using graphics 7 plus, or using graphics 8 with artifacting and the table data unchanged. He chose the second approach, so the colors are the result of artifacting.

Other manufacturers use this approach, as well. For example, *Jawbreakers* uses artifacting to color the playing field. The problem comes when artifacting is used with the GTIA chip, a new graphics chip recently released by Atari. The GTIA chip replaces the CTIA chip; both are the essential color television driver circuits for the Atari.

The GTIA has more graphics modes, and in my experience, gives a sharper display, than the CTIA. As of January 1981, Atari has shipped all Atari 800s with the GTIA chip.

There is just one drawback: the GTIA artifacts differently from the CTIA chip, and *The Wizard and the Princess* was written for the CTIA chip. Sandy and I had a GTIA chip in our Atari, so instead of the colors the author used, we got the particularly grim shades of green and blue.

I called On-Line and mentioned the problem. A fix was already in the works for GTIA machines. In the new version (which I haven't seen) a box is drawn onscreen and the player is asked if it is green or orange. Depending on which chip is installed, it will be one of those colors. The program then generates the correct colors from the color tables based on that information.

I mention all this about the GTIA chip because there may still be some of the older *Wizard and the Princess* disks being sold. If you have a new Atari, you will get a GTIA chip and the same terrible colors with an old version of the game. However, the people at On-Line are friendly and willing to swap disks if you have a GTIA chip, and don't want to see green.

Atari is making the GTIA chip available to CTIA machine owners. The upgrade will be performed at Atari service centers, or you may choose to buy the chip outright to do the installation yourself. Atari owners choosing this option should be aware that removing the bottom cover may void all warranties. To obtain the address and phone number of your nearest Atari service center, you can call Atari at (800)538-8547 (outside California) or (800)672-1430 (in California).—*DS*

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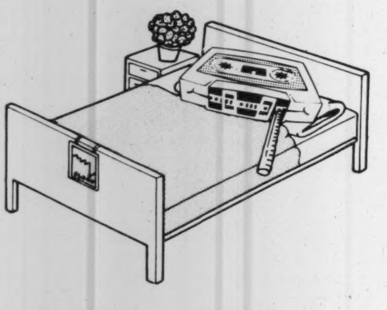

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CIRCLE 128 ON READER SERVICE CARD

Wizard, continued...

keypress. After that keypress, the output continues. If you press any other key but Return, you get a beep. This is a particularly awful sound, which makes you suspect that the POKEY sound chip is being flogged.

The beep is to let you know that what you are typing—typically the next command—isn't being accepted by the machine. It lets you know that the machine wants a Return before you can go on. No other key will satisfy it.

It is particularly irritating when the ouput from the machine finishes midway through the four-line text window. You assume it has said whatever it had to say ("The peasant woman warns you of a giant in the mountains"). So you would begin to enter a new line, and are rewarded with this awful beeee—eee—eeep.

You must then patiently hit Return and start all over.

"Frustrating" isn't the word. "Annoying" isn't, either. After the eightieth time it happened, I gave up and stomped off. My sister Diane, who is the epitome of patience and calmness, took over. She lasted until the hundredth beep at which point we had to restrain her from throwing the Atari into the TV.

Our nerves grew jangled. Our parents left for a nice, long, soothing walk away from the noise. Sandy and I started snarling unprintable things at each other. The dog began to howl after each beep.

Finally, I couldn't handle it anymore. So I went to my tool kit, almost picked up a hammer, but decided that there was a better way. I got a screwdriver, removed the bottom cover, and disconnected the speaker.

Once the speaker was disconnected (Remove the five lower screws on the Atari, pull the speaker plug off the jack, and reassemble), things improved. The whole mood of the family changed. Our parents returned. I gradually regained my sanity. Diane became calm, cool and collected once again. The dog even shut up. And we realized just how much the sound had annoyed us.

After this change, we settled down and really got to work. We enjoyed it immensely. The family's computer experience rated from very high to none, and all enjoyed the game equally. (In fact, those with the least experience often supplied the ideas to get around obstacles.) And after four days, we finally won.

We recommend it to Atari owners who want to try their hands at a little classic adventuring. We also recommend a phillips head screwdriver, to disconnect the speaker, if the beep feature hasn't been changed.

But all in all, it was a lot of fun to play, and well worth the price. Of the adventures available today, it is unique and very interesting—a real challenge. ☐

An Adventure for Beginners

David Lubar

Phoenix Software is bound to make many friends and fans with *Birth of the Phoenix*, an adventure designed for beginners. The company has a classification system for adventures, with categories ranging from novice to expert. *Birth of the Phoenix* is a class 1 adventure for novice players. While this means the game can be solved without a doctorate in obscurity, it doesn't mean the adventure lacks challenge or fails to be enjoyable.

For a modest price, Phoenix Software provides both an adventure on disk and a 19-page booklet filled with a wealth of tips and hints. Since adventure games have become a genre, there are certain common links that experienced players are aware of, such as techniques for getting through a maze, special applications for ordinary items, and general methods of survival. Normally, the only way a beginner can learn the ropes is through trial and error. The booklet, without spoiling any of the fun, or giving away too much about the game, covers many aspects of adventure playing. A good selection of humorous illustrations adds to the appeal of the booklet.

creative computing
SOFTWARE PROFILE

Name: Birth of the Phoenix

Type: Text Adventure

System: APPLE II 3.3 DOS 48K

Format: Disk (3.3 DOS)

Language: Machine

Summary: An adventure "tutorial" designed for beginners

Price: $22

Manufacturer:
Phoenix Software
64 Lake Zurich Drive
Lake Zurich, IL 60047

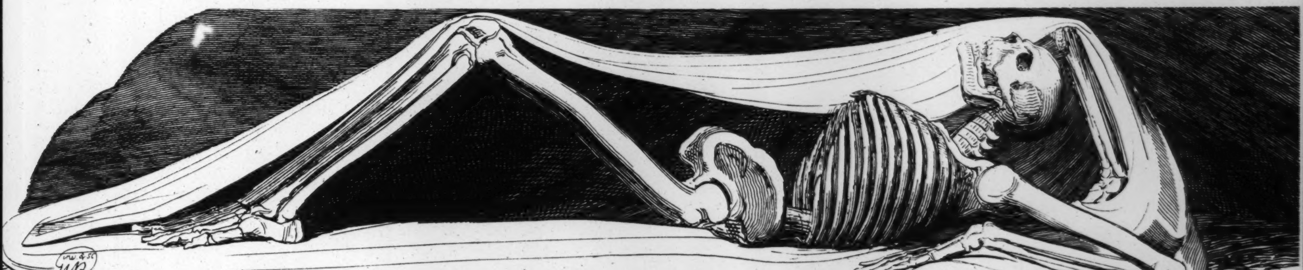
The beginner will find details on general topics such as how to move around an adventure world and how to construct a useful map. There is also information on specific areas, such as dealing with locked doors or finding a light source. While many of the tips apply specifically to *Birth of the Phoenix*, the information will help readers with almost any adventure on the market.

The game itself is a text adventure with several goals. The player must find certain treasures, but he must also help the Phoenix in a manner learned while playing the game. The game is, in a positive sense, a cliche. The player gets to sample a smorgasbord of events and encounters that typify adventures. There is a small maze, a magic word, a book, hidden objects, a locked safe, and a climbable tree. When a special item is required to gain access to a location, the item is never far away.

There is nothing tedious in this game. A beginner might want to try playing without aid of the manual first, to see how much he can do on his own. But he won't have to worry about frustration. Help is always at hand. And the player who has made his way through this game will be well prepared to tackle other adventures. One can almost imagine the computer spewing forth a diploma as the game is solved.

The only weakness in *Birth of the Phoenix* is that the save-game feature requires a blank disk, and only one version of the game in progress can be stored on a disk. Since most players will probably want to make frequent saves (having a good set of saves from all stages of the game can prevent a lot of back tracking and repetition), this can result in dedicating a pile of disks to the game. A system allowing saves with a file name would have made the life of a beginner a bit easier.

Putting this aside, *Birth of the Phoenix* is a great introduction to the realm of adventure games, and is highly recommended for anyone who has had trouble with other adventures, or who is planning to embark for the first time. Phoenix Software has done a good job, both in producing a playable game, and in helping people derive enjoyment from that game and from all other adventures. ☐



Napoleon's Campaigns and Road to Gettysburg

SSI Marches On

Dale Archibald

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SOFTWARE PROFILE

Name: Napoleon's Campaigns: 1813 & 1815

Type: Strategic wargame

System: 48K Apple II with Applesoft in ROM, or II+, 3.2 Disk Drive

Format: Disk

Language: Basic, assembly, and machine

Summary: A complex, thoughtful approach to gaming

Price: $59.95

Manufacturer:
Strategic Simulations, Inc.
465 Fairchild Dr., Suite 108
Mountain View, CA 94043

Someday, perhaps, SSI will unveil a game that requires no instruction book. It will be packaged like many others in a tasteful plastic bag with a garish illustration. It will be just another slip in, flip on, and flip out.

After all, why should the company continue to offer a good box, two-colored maps, cardboard counters, a prompt card, 14-page 8 1/2"x 11" instruction book, and service when others don't?

I'm joking, of course. SSI has published some of the most complicated—and engrossing—games available for personal computers. The latest ones fit the line perfectly: they're complicated and engrossing, fog-in-a-box if I ever saw it.

By fog, I'm referring to fog of war, where because of the numbers of men and the confusion of battle, a commander often has no idea what's going on where until it's too late to do anything about it.

Joel Billings, president of the company, says *Napoleon's Campaigns* and *Road to Gettysburg* are 90% the same. That is, the major factors of the games are very much alike.

Each, however, has its own personality and quirks.

Napoleon's Campaigns

Napoleon's Campaigns offers two scenarios, which can be played solitaire or by two players. First, of course, is Waterloo, June 15 through 19, 1815. Second is Leipzig, October 14 through 19, 1813.

The solitaire Waterloo player must take the Allied side, while in Leipzig he must command the French.

Among other problems, the player must keep lines of communication (LOC) open at all times. Messages take longer to reach corps commanders who are far away from headquarters, and when they do arrive they may not be obeyed.

Each corps commander has a leadership ranking determined by "Leadership Value/-Aggressiveness." A commander may be very good, but excessively timid (indicated by a negative value).

The Allies are divided into two groups. The Prussians are in four corps, as are the Anglo-Allied forces. Each army has an LOC it must protect.

The victory conditions for Waterloo are these: French troops in Brussels at the end of the game are worth 50 points; Allied HQ eliminated, 30 points; French corps in Liege, 30; 15 for each Allied corps eliminated; and so on. The French lose 100 points if their HQ is eliminated.

At Leipzig, the scores are lower, but the idea is the same. You begin by establishing the LOC by moving a cursor along a road across a map graphic.

Next, you number the corps by marching priorities. Lower numbers have the right of way over higher numbers. (Allies are assigned numbers arbitrarily, to reflect the lack of command control.)

Then, and only in the Waterloo scenario, the French player designates starting positions within a certain area.

Starting urgency is assigned. Movement of units with high urgency (and high leader aggressiveness) will force march more and rest less. This also determines the ferocity of a battle, how many troops are placed in each echelon (on front lines, second and third lines of reserves), and other factors.

Last, starting contact mode is assigned. This may be acting on Initiative (careful but slow), Withdraw on contact, Stand, Attack, or Hasty Attack (which attacks undeployed, and suffers heavier casualties).

The scenario unfolds with activity reports (true and false) reporting concentrations of friendly and enemy troops. Next arrive the battle reports, with time, place, casualty estimate, and enemy strength before the battle. These are followed by reconnaissance reports, then location reports from the various corps.

After all reports have been received, orders may be given. There are three menus of orders.

First are Strategic Orders. You can look at the map of the battlefield, designate a secondary army commander, save the game, end the turn, order a corps or a force (any corps within one turn dispatch distance), or look at dispatches again.

If you decide to Order Corps, you can order individual corps to change urgency, set march mode, set contact mode, retreat to a specified hex, attack a particular hex, reinforce one, move, patrol, and change deployment from road to deployed or vice-versa.

If you decide to Order Force, you can move the entire group by selecting the farthest unit back and tracing its path through the others; set urgency or contact mode for all units, change deployment, or patrol.

The Road to Gettysburg

As I mentioned earlier, *Road to Gettysburg* is a cousin of Napoleon's Campaigns. It covers both the Campaign (June 28 to July 4, 1863) and the battle (July 1 to 3).

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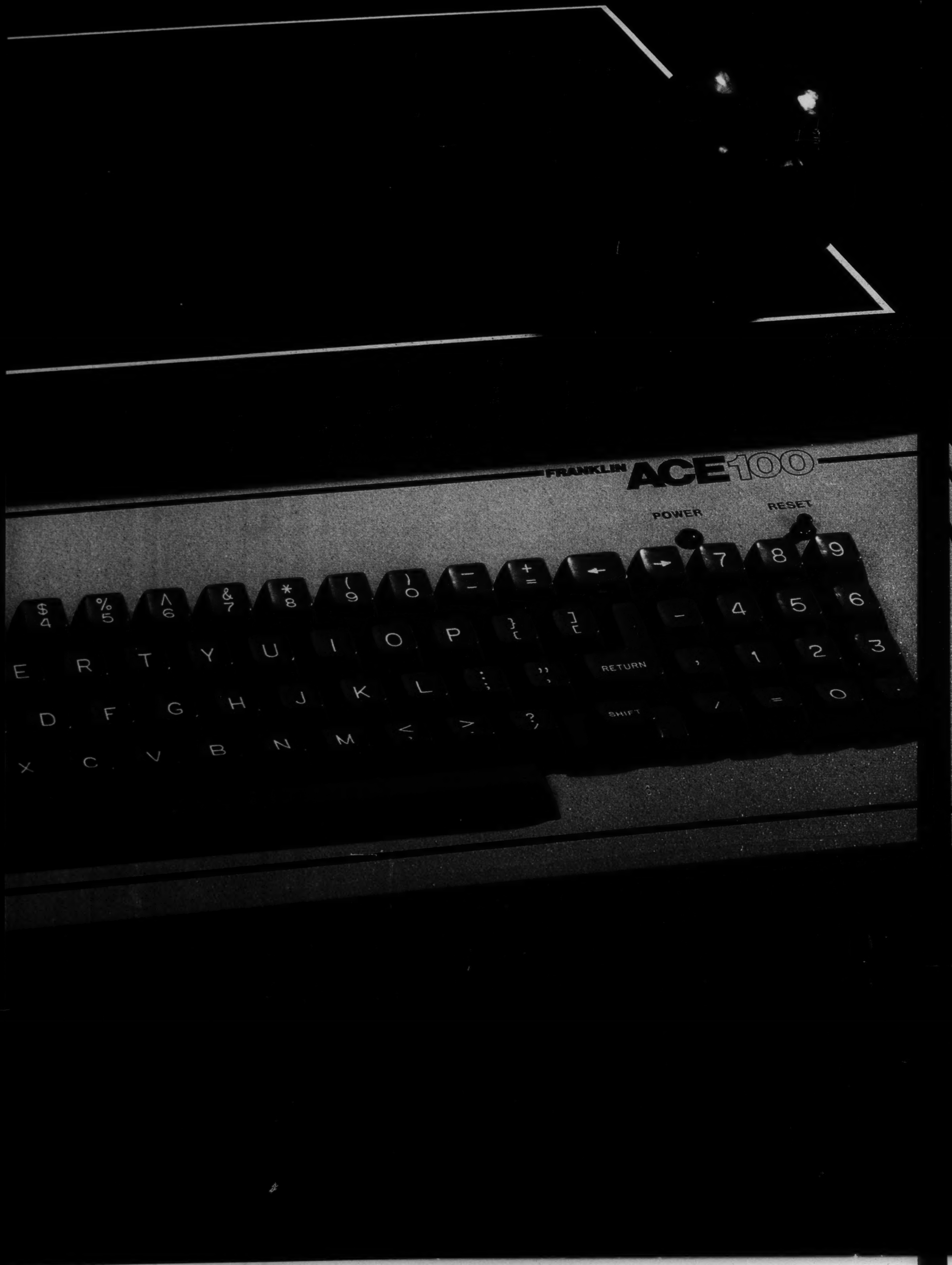
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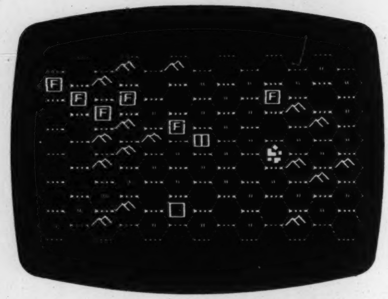
CIRCLE 165 ON READER SERVICE CARD

Gettysburg, continued...

Road is a more open game than *Napoleon's Campaigns.* It has much less cavalry, so both players are uncertain of where the enemy is. (In the solitaire versions, the computer plays the Union side.)



Screen display from *The Road to Gettysburg.*

There is no LOC in this game, but there is the added complication of foraging for the Confederates. That is, resting Confederates will forage from the hex in which they are located. A town has five forage points; a road, three; and a clear hex, two. These are also victory points: forage all points from an occupied town, and you lose five points.

creative computing
SOFTWARE PROFILE

Name: The Road to Gettysburg

Type: Napoleon's cousin

System: 48K Apple II with Applesoft in ROM, or II+, 3.2 Disk Drive

Format: Disk

Language: Basic, assembly, and machine

Summary: A more open game than Napoleon's campaign, but complex nevertheless

Price: $59.95

Manufacturer:
Strategic Simulations, Inc.
465 Fairchild Dr., Suite 108
Mountain View, CA 94043

The point of this, of course, is to force the Confederates to spread out. Three units foraging in a road hex will deplete its forage points in one move. What could be an ambush might not develop because of the necessity of movement.

Another difference in *Road* is the straggler rule. That is, Union infantry may lose as much as 12% of their strength (Confederates, 6%) in a night forced march because of troops dropping out. Later, if it rests, its full strength will return.

The reports received from the corps, and the way orders are given to the corps and forces, is exactly the same as in *Napoleon's Campaigns.*

An interesting feature of *Road* is the "Optional Battle." It allows players to resolve combat with miniatures, cardboard pieces, etc., without the computer. The program lists the statistics of all units involved in the battle and allows the players to save the game. When restarted, it asks for casualties and fatigue suffered by each corps involved.

Nevertheless, whether you use this option or not, in either *Napoleon's Campaigns* or *Road*, it will take several tries before you become confident that you are giving the correct orders.

These games, both programmed by Paul Murray, are not easy ones. The instructions could use a bit more explanation in some areas, and I wish there were some way to see accumulated victory points without having to go through the entire game.

I also wish the maps were of some other type, because it is easy to dislodge pieces when you go to another room to let your opponent place moves into the machine.

However, if you enjoy long (3-4 hours), involved games with vast amounts of detail, *Napoleon's Campaigns* or *The Road to Gettysburg* may well be for you. ☐

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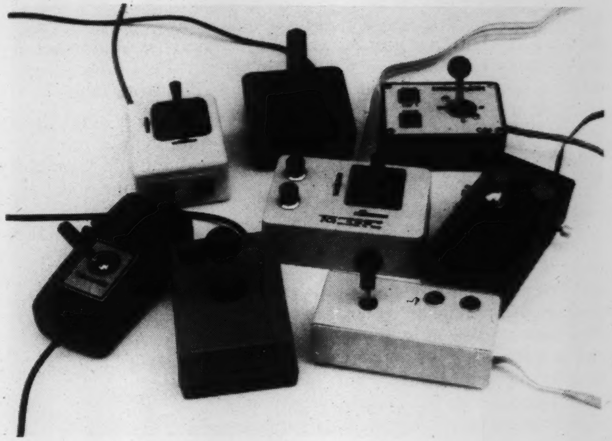
CIRCLE 225 ON READER SERVICE CARD

For Apple and Atari

Joysticks, Paddles and Game Port Extenders

Part 1 of 3

David H. Ahl



Blisters and Frustration

Do you find yourself putting off a game of *Super Invaders* or *Sneakers* because of the too-small button on the Apple Paddle controller? Did you buy *ABM* or *Red Alert*, only to find them too frustrating to play without a joystick? Do you find *Snack Attack* or *Jaw Breaker* impossible to play from the keyboard?

Increasingly, with the sophisticated game designs appearing on the market and with more and more designers copying the popular arcade games, it is next to impossible to enjoy these games without a good set of paddles and joystick controls.

In this pair of reviews, we examine many of the popular paddle and joystick controls now available for the Apple computer. We also look at some ancillary accessories which make these controls easier to use.

Paddle Controls

The word paddle is a misnomer. The rotary control called a paddle is actually a variable resistor, which is also (correctly) known as a potentiometer or rheostat. In a sense, the control is the same as a volume control in a radio except that the resistance varies in a linear fashion from the beginning to the end of rotation in a computer control where as it follows an "S" curve in most audio devices.

The reason this control is called a "paddle" in the personal computer industry is that it originally got its name from the control which moved the paddles on the screen in the game of Pong. This was followed by the game of Breakout and by then the incorrect term, paddle, had taken hold.

In a book that I am working on, an editor changed the word paddle to "knob." This, of course, is equally incorrect. However, since it is unlikely that the computer world is going to grow to love the correct term potentiometer or rheostat, we are stuck with paddle.

Incidentally, it is up to the computer program to translate the resistance value from the paddle into something that can be used in the program. In the Apple, normally one end of the resistance is assigned the value of 0 and the other end 255. However, game designers can achieve much tighter control, i.e., less paddle rotation, by using the value of say 60 as one edge of the screen and 180 as the other.

Good software must also take into account one other factor: paddle and joystick adjustment. Since there seems to be little standardization among manufacturers as to the value of the potentiometer to be used in paddles and joysticks, good software should allow the user to set the joystick or paddle to one extreme and then the other and adjust the program accordingly. Of course, another acceptable approach is to use just a portion of the rotation. The resistance of the potentiometers in the paddles and joysticks we have measured has varied from a low of 70K ohms to a high of 185K ohms. The nominal value "expected" by the Apple computer, incidentally, is 150K.

Controls with higher resistance require less rotation from one side of the screen to the other, thus the control responds more quickly. On the other hand, high-resistance controls are less precise for making fine adjustments needed to hit small targets such as the bonus pine trees in *County Fair*.

Joystick Controls

Joysticks come in two varieties. First is the type found in most coin-op arcade games, the Atari Video Computer System and the like. It has four switches corresponding to the four directions that the joystick may be pushed. Hence, when the joystick is in the center position, all switches are off. If it is pushed squarely to the north, east, south or west, one switch will go on for each direction. An intermediate (diagonal) direction will normally cause two of the switches to close.

In the joysticks used in arcade games, the diagonal directions are sometimes "locked out" by means of nylon adapter plates which permit movement in only four (sometimes only two) directions.

A second type of joystick is one which uses two potentiometers, one for the north/south or Y direction and the other for the east/west or X direction. This type of joystick often does not have automatic centering as the four-switch joysticks usually do. Centering on the ones that have it is usually accomplished by means of small springs which may be removed if the user desires.

In general, a potentiometer-type joystick may be used for all joystick applications whereas a switch-type is useful only for games requiring on-off movement control in two, four or eight directions. However, it is generally easier to use a switch-type joystick for the Pac-Man and Berzerk families of games as it provides more positive control and better centering.

User Features

The motoring magazines sometimes say of a car, "the controls fell naturally to hand." We found that some of these controls felt better in the hand than others. Indeed, some were clearly designed for table top use and did not fall at all naturally to hand. Furthermore, hand sizes are different, so what may be a good hand held control for an adult male may be overly large for women and children.

Tactile feedback is the positive indication to the user that contact has been made in a control. Two schools of thought exist about tactile feedback both among users and manufacturers. One holds that it is necessary and good. The other holds that it is unnecessary and not cost-justified. I know people who want a positive click when a firing button is pressed whereas I press buttons forcefully enough that I don't need or want any additional feedback to tell me that I've made contact. Since it is a matter of personal preference, we have simply noted in the chart whether a control has tactile feedback or not.

Game Control Extenders

Ordinary DIP (dual in-line package) sockets are not designed to be used over and over; eventually they won't make contact. Also, repeatedly stressing a 16-pin connector will cause the pins to bend and possibly snap off. Furthermore, continually messing around with the game I/O connector on the back of the Apple motherboard is just not healthy for the motherboard itself.

Hence,if you expect to change back and forth between joysticks and paddles very much, we strongly recommend a game control extender. One type consists of a quick disconnect zero insertion pressure I/O port mounted on the outside of the computer. The device is permanently plugged into the Apple game port inside. Examples of such devices are the EZ Port from Versa Computing or game socket extender from Happ Electronics. Utilizing a ZIP (zero insertion pressure) socket, the user merely plugs in his 16-pin DIP plug and throws a small switch which engages the connection within the socket.

An alternative to a single port extender is a switchable port unit. While more expensive than single extensions, these units allow paddles, joystick, lightpen, VersaWriter or other control devices to remain plugged into the Apple permanently.

We've found it useful to paint the notched end of the DIP connector of various plug-in devices with a small dab of white paint or liquid paper. This marked end corresponds to Pins 1 and 16 which are the up direction on most extension port devices when they are mounted on the right side of the Apple case.

Protect the Connector

We also keep small pieces of styrene around to plug the DIP connectors into when the device is not in use. All too often pins have been broken or bent when a socket was accidentally stepped on or banged by a chair. The white styrene (a packing peanut will do quite nicely) not only protects the plug but is also quite visible if it falls on the floor.

Atari joysticks use an Atari-type DE-9 plug (which is considerably more rugged than a DIP connector. Nevertheless, repeated insertion and removal tend to distort the female receptacles on the joystick cables.

To overcome the connector vulnerability problem, CJM has gone to rugged but more expensive Cinch Jones connectors (see description below).

Test Procedure

Each paddle and joystick was given a thorough workout by all members of our game testing panel. As we've mentioned before, our panel consists of adults and children of both sexes over a wide age range. Thus, products are judged from many different perspectives.

Paddles were tested using the following games: *Torax*, *Tsunami*, *Sneakers* and *County Fair*.

Potentiometer-type joysticks were tested using *Photar*, *ABM*, *Pegasus II*, *Red Alert* and *Twerps*.

Switch-type joysticks were tested with *Thief*, *Snack Attack*, *Jaw Breaker* and *Labyrinth* on the Apple and *Onslaught* and *Star Raiders* on the Atari Personal Computer.

Recommendations

For maximum game playing enjoyment, we recommend the following for the Apple computer.

1) *A set of paddles.* Paddles differed mainly in firing button placement, size, shape, and throw. You should look for one that suits your style of play. In general, left handed players will find fewer suitable paddles than right handed players.

2) *A potentiometer-type joystick.* As with paddles, the main differences among joysticks were in the firing buttons, although, as the individual descriptions indicate, there are other differences as well. We recommend a joystick which is not self-centering or one in which the self-centering can be defeated—preferably outside the case. While trim adjustments are desirable, most joysticks did not have this feature, and those that did were not necessarily the best in other regards. If you do not have or plan to get a switch-type joystick (see number 3), then you should probably get a potentiometer-type joystick with self-centering.

3) Switch-type joystick. The value of this type of joystick for playing Pac-Man, Berzerk and maze games cannot be overstated. It is far superior to a potentiometer-type joystick and you will be astonished at the added enjoyment of playing games using this type of joystick. To use a switch-type joystick with the Apple computer, you will need an adapter of which there are only two on the market—from Astar and Sirius. Naturally, you must have this type of joystick for the Atari Personal Computer and Video Computer System.

4) *Game port extender.* It is a matter of personal preference whether to get a single game port extender with a zero insertion pressure socket or a more elaborate unit with up to six sockets for external devices. While all the extension devices tested had one or more desirable features, no one device had absolutely everything. Our ideal device would be one with four switch selectable, zero insertion pressure DIP sockets, two non-diode isolated sockets, and two switch selectable DE-9 sockets. The device would also have a jumper panel so that one or two of the DIP sockets could be wired to your own specifications.

5) *An external speaker or hi-fi adapter* (see reviews for explanation).

By selecting the cheapest device in each category, a set of these five devices could be put together for as little as $100. However, a more realistic budget would be $180-200. That may sound like a lot, however, the increased enjoyment from playing games with quality controllers and good sound cannot be over-emphasized.

Have fun!

Potentiometer Joysticks

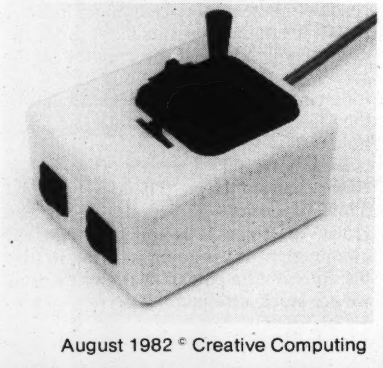
A2D Joystick (2001)

In contrast to other joysticks, the A2D Model 2001 features an open gimbal design usually found only in precision radio controlled model airplane controls. According to the brochure, "this design results in a lighter feel and more precise movement than that available with ball stick assemblies." We found this to be true and, in fact, found that this design allowed us to play games for which we normally recommended a switch-type joystick (Pac-Man, Berzerk, etc.).

The compact size of the Model 2001 permits it to be easily held in one's hand and the placement of the two buttons on the back allows them to be pressed with the index and middle finger of the hand holding the joystick. Unlike some others (and the earlier A2D Model 1002), the Model 2001 does not favor either left or right handed players. We especially liked the buttons on this joystick. They are large (5/8" square), have a very short throw, and provide excellent tactile and aural feedback.

Mechanical trim is provided for each axis, allowing accurate self-centering of the stick.

The control knob on the joystick is relatively small and is held by friction to



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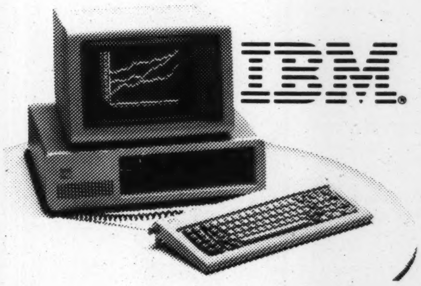

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the end of a non-threaded shaft. People had mixed feelings about this. Some liked the small size because of the precision "feel" it seemed to impart. Others, however, found the knob occasionally came off in their fingers during particularly violent play of a game. Once aware of this, most players were able to adjust their playing style to compensate.

The Model 2001 comes with an extremely generous 8-1/2' shielded cable. As it is round and not a ribbon connector, it is quite flexible.

In summary, the A2D Model 2001 is an outstanding joystick in practically every respect and it got high marks from all members of our playing panel. Our only minor criticism is the friction-fit knob, but most people will not find this a major drawback.

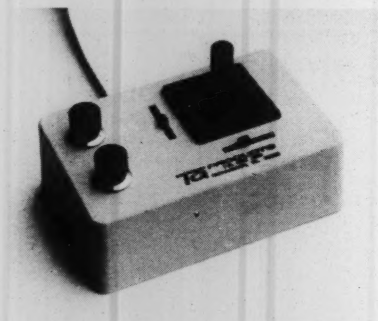
TG Super Joystick

The housing of the TG Super Joystick was the largest one tested. Its larger size coupled with the placement of the firing buttons on the left top of the case make it most suitable for table top operation. Some right handed players found it could be held in the left hand for games using only one firing button.

The firing buttons are large (0.6 in dia.) and flat; thus they are easy on the fingers. They do not provide any tactile feedback and must be pressed all the way down to make contact.

The joystick itself is self-centering, a handy feature for playing *Twerps, Borg* and other games in which it is necessary to remain stationary on the screen. Self-centering may be defeated by removing the bottom of the case (four screws) and, with a needle nose pliers, removing four small springs from the joystick mechanism. This is a mixed blessing. While it is handy to be able to defeat self-centering, it is not something you want to do frequently. After two back-and-forth changes, we decided to leave self-centering in effect permanently.

On the other hand, the trim adjustment controls are on the top of the case and are easy to adjust when necessary.



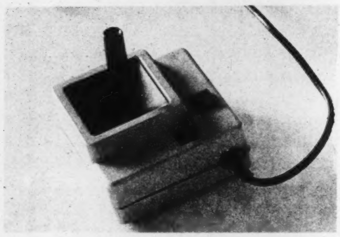
The joystick knob is on the small side and is held by friction to a non-threaded shaft. As a result, it occasionally came off during exuberant game play. However, as with the A2D stick, most players were able to adjust their playing style to compensate.

In summary, for a right handed player the TG Super Joystick is a good quality product with some minor drawbacks that did not substantially detract from its overall performance.

Joystick II

Joystick II is a compact (3-1/2" sq) joystick for either table top or hand held use. Because of the firing button placement at the left top of the unit, it tends to favor right handed players.

The joystick handle is small in diameter (3/8"), but its length makes it comfortable to use.



The firing button for direction 0 is 1/2" square and provides both tactile and aural feedback. Unfortunately, the switch for direction 1 is just that, a switch. To the left, it is on (like a light switch) while to the right it provides momentary contact with spring return. We found this arrangement was not suitable for playing games such as *ABM* and *Pegasus II* which require the use of both firing buttons.

The first unit we received provided variable resistance in direction 0 of 30K to 130K ohms (values of 50 to 255 to the Apple) and thus could not get to the right boundary in most games. We removed two rubber feet, opened the case, and were able to adjust the shaft position on one pot to correct the problem. Another unit tested in a local computer store did not have this problem.

Installation of Joystick II is the best we have seen. A rubber strain relief 6" from the DIP plug end of the cable fits in the notch at the back of the Apple. A U-shaped ground clip connected to the cable shield fits over the notch thus minimizing RF interference.

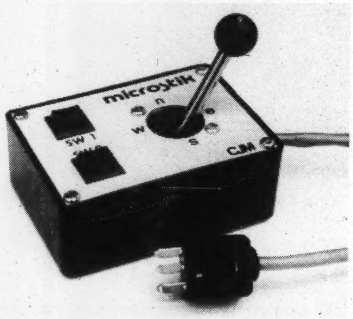
The instruction booklet is excellent and provides a test program. Were it not for the strange switch instead of a more desirable firing button, we would have given Joystick II our highest rating.

CJM Microstik

Of all the joysticks tested, the CJM Microstik had by far the easiest movement. In other words, the resistance to moving it in a given direction was virtually nil. Also, because of its larger ball (nearly 3/4" in diameter) and longer handle, it left all of the users with the impression that it was extremely easy to move and adjust. Indeed, it was one of the few joysticks that could be substituted for a paddle in games which required precise adjustment (*County Fair, Tsunami*, etc.). It was also suitable for use with games for which we normally recommend a switch-type joystick such as *Thief* and *Snack Attack*.

On the other hand, because the joystick moved so freely, several panelists complained that they felt themselves gripping it with a high degree of tension to keep it in the proper position, especially with games such as *Torax* and *Photar*. Nevertheless, the tension, in some cases contributes to accurate adjustment and some panelists found themselves getting excellent scores in these games. Others just found themselves unduly tense.

The pair of 1/2" square firing buttons on the left top of the joystick assembly strongly favored right handed players, i.e., those who wanted to control the joystick with their right hand and fire with their left. On games which required both firing buttons to be pressed, the joystick was most suited for tabletop use, whereas on games with only one firing button required, handheld control was possible with the left thumb controlling the firing button. The buttons are very short throw and provide aural, but not tactile feedback.



The cable is fairly short (3' 4") and terminates in a six-pin Jones plug which must be used in conjunction with a CJM Applexpander. Since this is designed to be mounted on the right outside of the Apple computer housing, the short cable length is not a disadvantage.

In summary, the CJM Microstick is of excellent quality throughout its exceptionally easy movement coupled with the long throw may well make this the joystick of choice for you.

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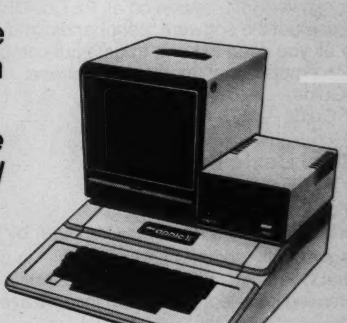

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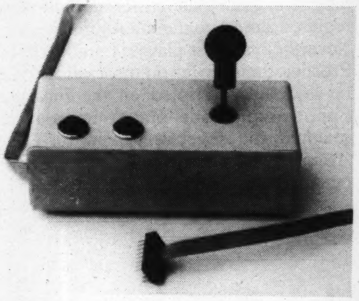
CIRCLE 265 ON READER SERVICE CARD

Joysticks, continued...

Datamost Joystick

A metal case coupled with a 3/4" diameter joystick ball contribute to the solid feel of the *Datamost Joystick*. Two pushbuttons are mounted on the top left of the case toward the rear; unfortunately, they are somewhat small—just over 1/4" in diameter.



While the small size of the housing lends itself to holding in one's hand, we found that only one button could conveniently be pushed at one time. Thus, handheld use of this control was not suitable for games such as *Pegasus* and *ABM* which require both buttons to be used. For games such as this it was necessary to put the case down on a flat surface and control the buttons with the opposite hand (usually left) from the one controlling the joystick movement. One of our panel members who preferred lefthand control of the joystik and righthanded button pushing found this control rather awkward because of the left side position of the buttons.

Although button movement was very short (about 1/10"), a desirable feature, some of our panelists felt that more pressure was required to press the buttons than with other joysticks. Indeed, several of our panelists complained of finger fatigue after using this unit.

The Datamost joystick handle has extremely short play; as a result it has fast action but is difficult to adjust precisely. It is not self-centering nor does it have potentiometer adjustments. There are no instructions included with the unit.

In summary, for a righthanded player, the Datamost joystick offers a solid feel, quick action, 3/4" diameter ball and short button movement. Button pressure seemed high and button placement was awkward for lefties.

Astar Robo Stick-1

The Robo Stick-1 is a high-quality joystick imported from Japan by Astar International. Indeed, we found it good enough to use in place of paddles for games such as *Torax* and *County Fair* which require rather precise paddle movement.

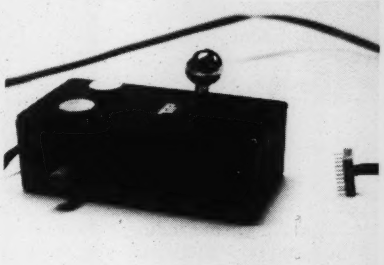
The resistance of Robo Stick is very low (75K ohms) which contributes to the feeling of precise movement. On the other hand in some games which look for the full 150K ohm resistance, Robo Stick was unable to reach the edge of the screen—a rather serious disadvantage.

The hand control is a nice chrome ball approximately 3/4" in diameter. Two 3/8" diameter pushbuttons are located on each side of the rear part of the black plastic case.

The firing buttons on Robo Stick are concave, i.e., the rim of the button is higher than the center. In games requiring much firing, this can be very hard on one's fingers.

We found it most comfortable to hold the case in either the right or left hand using the thumb and middle finger to control the two buttons while the other hand attends to the control of the joystick. People with small hands may find handheld use difficult.

We found that people had relatively strong preferences as to the placement of firing buttons and joystick controls. Those who liked Robo Stick-1 did not particularly like the TG joystick and others like it. These joysticks have both buttons to the left side on the top of the control. In general this arrangement is more suitable for leaving on a flat surface while Robo Stick is more suitable for holding in one's hands.



Robo Stick-1 is not self-centering nor does it have potentiometer adjustments. We are told by the manufacturer that Robo Stick-2 will have a feature which will permit it to be either self-centering or not as the user desires.

The instructions for the Robo Stick-1 include a game program to check all of the functions. It's not a wonderful game, but it is a way of testing the joystick if you don't have any other programs which use a joystick.

In summary, were it not for the concave firing buttons and low resistance potentiometers, we would have rated Robo Stick outstanding. Because of the precision feel and good arrangement of firing buttons, we still think it is a good choice for playing most joystick games, particularly at the bargain price of $29.95.

Video Stik

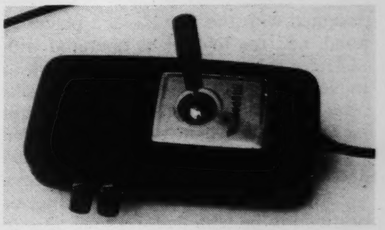
Three years ago the Video Brain computer was announced with much fanfare. It was a well-engineered unit designed to compete with the Bally Arcade, Interact Personal Computer, and others of its ilk. Unfortuntely, Video Brain made a bet on the APL language, their version being APLS. Unfortunately, this was not a wise choice and Video Brain went out of business within a year.

However, they manufactured a great number of joysticks and other accessories and kept the company afloat a while longer selling these accessories. Today, Video Brain is long gone, but their joystick lives on in the form of the Video Stik now marketed by Zircon.

The joystick itself has a longer stick and a longer throw than most other units on the market. This, coupled with its low 90K ohm resistance, allows more precise control than most other joysticks. On the other hand, like the Robo Stick, with certain games it cannot reach one extremity of the screen.

Video Stik is designed for handheld use and favors the lefthanded player because of the placement of the two firing buttons on the left side of the unit. In other words, when it is held in one's right hand, the two firing buttons may be easily controlled with the index and middle finger while the joystick may be moved with the left hand.

If used with an adapter such as Paddle-Adapple or software which allows interchanging the two axes, it is possible to reverse the normal axes thus permitting the joystick to be used upside down. Then it can be held in the right hand with the buttons controlled by the middle and ring finger of the left and joystick movement controlled by the right hand. Unfortunately, this reversal of axes is not always possible, hence Video Stick is probably best suited for lefthanded operation.



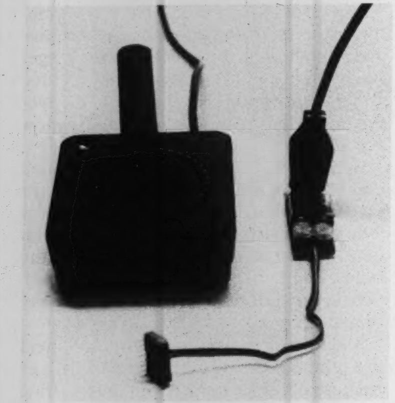
The handle occasionally came unscrewed, a minor annoyance. The firing buttons on Video Stik are slightly concave (outer rim higher than the center) and thus were somewhat fatiguing in games requiring a great amount of firing.

Video Stik comes with a 6' cable, two feet longer than most others. Although it has drawbacks, the long throw of the joystick coupled with the good handheld feel might make Video Stik the joystick of choice for you.

Switch-type Joysticks

Atari Joystick

Probably the best known joystick in the industry, the Atari Joystick has two main virtues: it is cheap and reasonably reliable. Buoyed by the sales of millions of video computer game systems, an Atari Joystick is now found in one out of five homes in America.



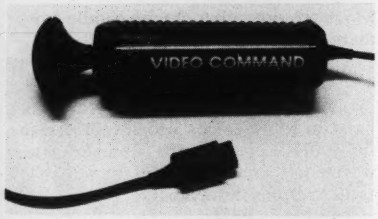
The mechanism is simple. Pushing the joystick tilts the 1-1/2" diameter nylon base of the stick against a dimpled piece of light metal on a printed circuit board. When the stick is released, the dimpled metal pops back to its original (off) position. The firing button operates the same way. Thus, all of the contact surfaces are protected under a thin layer of mylar on a printed circuit board. On old Atari joysticks, these switch contacts were exposed, thus leading to much earlier failure than newer ones are subject to. Nevertheless, the mechanism is hardly arcade quality and is likely to need replacing sooner than most other joysticks.

With the firing button in the upper lefthand corner, the Atari joystick is clearly designed with the righthanded player in mind, i.e., the joystick is operated with the right hand and the firing button with the left. Of all of the switch-type joysticks tested, the Atari took the highest amount of force to move in a given direction. Nevertheless, with a list price of $13.95 each, frequently discounted to far less, the Atari Joystick is a good buy and seems destined to be with us for a long time to come.

Zircon Video Command

Remember the Fairchild Channel F video game unit? Everyone liked the joysticks. Channel F didn't survive, but the joysticks did, and Zircon bought them.

The Video Command Joystick is a replacement for the Atari joystick. It is about 5" long and 1-1/2" in diameter, designed to be held in one's hand. The moving joystick control at one end may be controlled by the thumb of the hand holding Video Command or by the other hand. The firing button is built-in; depressing the entire joystick mechanism closes the contact.



We found this to be an outstanding replacement for the Atari joystick in most games—most games for the Atari that is. Its short, positive throw coupled with the built-in firing button makes playing games such as *Star Raiders* and *Onslaught* a positive joy. It is also excellent for most games on the Atari Video Computer System.

However, since movement is so easy with Video Command, it is not a good choice for playing games which require positive movement and a return to the center position between movements, i.e., Pac-Man and its derivatives and Berzerk and their derivatives. For these games we found the more positive spring mechanism in the standard Atari joystick highly desirable.

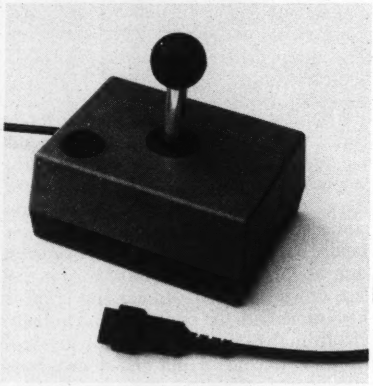
Newport Prostick

The main business of Newport Machine Design is manufacturing joysticks for the video arcade game industry. Now, they have taken their Model 150 arcade-game joystick, mounted it in an attractive plastic case with a firing button, added a cable, and market it as a replacement for the Atari Joystick. In all respects, it is superior to anything else currently available (with one exception—see below). The 1" diameter ball is permanently attached to the shaft so it can't come off in your hand as others occasionally do.

The joystick uses four leaf switches which are closed when a 1" diameter nylon "contactor" (attached to the end of the joystick) is pressed against the moveable leaf. This contactor is held in place by a spring and a "C" clip. If the user desires, this contactor may be reversed to put more pressure on the spring and thus provide higher resistance to joystick movement. We don't recommend this change, as the way the joystick is shipped provides excellent feel and positive centering.

Another good feature about the Prostick is that all parts may be replaced individually without replacing the entire unit. Thus, if the contacts on one of the leaf switches becomes worn and filing with emery cloth does not restore it to reliable operation, one need replace only the one faulty switch. This is not possible with any of the other joysticks we tested.

If we have one complaint about the Newport Prostick, it would be with the firing button (the one component not manufactured by Newport). The button has a longer throw and is harder to press than the one on the original Atari joystick. As might be expected, this led to player fatigue in games such as *Onslaught* which required almost continuous button-pressing. Nevertheless, most players found that with Prostick their scores on most games could be doubled or tripled on the first play. For example, one player immediately reached the seventh screen on *Snack Attack*, whereas his previous high had been the third screen.



In summary, this is a superb joystick for the serious and even not-so-serious game player. Newport Machine Design was started eight years ago by Werner Marhold when he emigrated to California from his native Germany. Thus, it would be unfair to say that the Newport Joystick is the Cadillac of the industry, rather one should call it the Mercedes.

Since the Newport Prostick is not widely available in retail computer stores, we have listed the east and west coast distributors of the product.

For the do-it-yourselfer Newport also markets their top-of-the-line Model 125A arcade game joystick. The Model 125A sports a large 1-3/8" diameter ball permanently attached to the shaft. Four high-quality leaf switches are held with machine screws and lock washers to a steel switch plate, which in turn, is held with four screws, lock washers and spacers to a heavy steel mounting plate. Four interchangeable nylon bushings come with the unit which permit two, four or eight way operation. As with the Model 150, the spring may be reversed on the contactor to provide more forceful operation.

The Model 125A Joystick along with a five foot long cable with DE-9 (Atari) connector on one end is available direct

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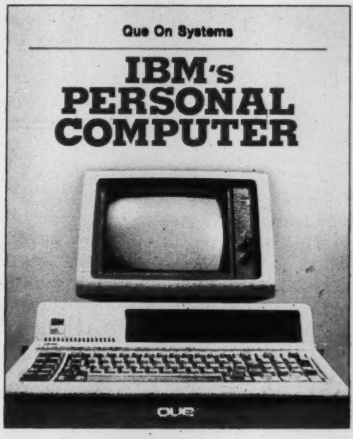

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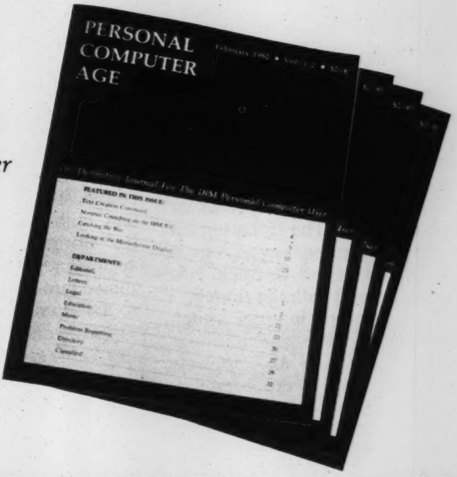

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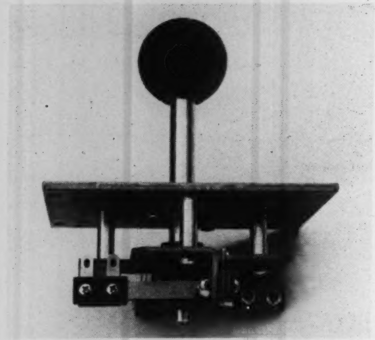
Joysticks, continued...



from Newport Machine Design, P.O. Box 418, Bishop, CA 93514, for $34.50 postpaid. Do not send to Newport for the Model 150 Prostick; only the Model 125A is available direct. Watch *Creative Computing* in an upcoming issue for an article on how to use this joystick to build your own high quality unit for the Apple, Atari or VIC.

Le Stick

Le Stick is a switch-type (Atari) joystick with a difference: there is no movable joystick! Le Stick is designed to be held in one's hand and simply moved forward and back, right and left to signal the program what you wish to do. It achieves this amazing action by having a set of mercury switches inside which detect when Le Stick has been tilted 20 degrees or more in one direction. The firing button is still of the conventional type and is found on the upper end of Le Stick. It is designed to be pressed with the thumb.

Le Stick has another internal switch which is activated by squeezing the handle. This "turns off" Le Stick and prevents any signal from going to the computer until it is released. We haven't found any use for this with commercial games, but it might be handy when writing your own.

We found that Le Stick takes some getting used to. Indeed, some players found it so "foreign" that they elected quickly to return to a conventional type of joystick after our test was over. Other players, on the other hand, loved Le Stick—especially the freedom to play with one hand.

Of all the joysticks tested, Le Stick was the most different. People had no middle-of-the-road opinions about Le Stick; they either hated it or loved it. We advise trying out Le Stick at a dealer or show; you may well find that it is the joystick for you.

Coming in September

- In-depth evaluations of three joysticks that did not arrive in time for this first round of play testing.
- Evaluations of eight paddle controllers.
- Evaluations of nine extension and auxilliary game port devices.

Coming in October

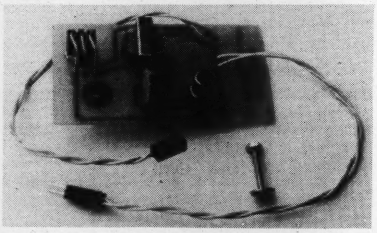
- Joysticks for TRS-80 Model III and Color Computer.
- Building a linear paddle control for the Apple and TRS-80 Color Computer.
- Building an arcade-quality joystick for the Atari.

Happ Hi-Fi Adapter

We have mentioned several times on these pages that the built-in Apple speaker leaves a lot to be desired and that a great improvement in sound can be obtained by replacing the Apple speaker with an external one. For maximum convenience, we have recommended that an SPDT toggle switch be installed on the side or back of the case to make switching between the two speakers convenient.

Now Happ Electronics has come along with an even more exotic and convenient device. The Hi-Fi Adapter consists of a small PC board which is mounted on the right inside of the Apple case. The handle of a toggle switch extends through the cooling fins on the right of the Apple case. The unit plugs into the Apple speaker connector and has two outputs. One simply connects to the internal Apple speaker and, with the toggle switch down, allows for "normal" operation. With the toggle switch in the up position, the sound is routed through a small isolation transformer to the input of a hi-fi amplifier.

As anyone who has tried to connect the Apple speaker output directly to a hi-fi amplifier knows, both sides of the speaker output are above ground and connecting one side to the ground of an external amplifier creates havoc in the Apple. This havoc takes a variety of forms, the most common of which is the equivalent of constantly hitting the reset key. Needless to say, this is highly undesirable. The Happ Hi-Fi Adapter cures this problem and makes it possible to run the speaker output through a hi-fi system.



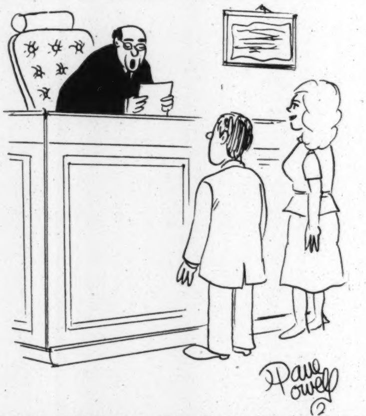
Since the Apple puts out only one channel of output, we recommend for amplifiers without a monaural switch that a Y connector be used to split the signal into two channels. Short connector cables (one RCA female input, two RCA male output jacks) are available from Radio Shack and other electronic supply houses for about $2.00.

If you have not used an external speaker (or amplifier), we can confidently predict that you will be astonished at the results.

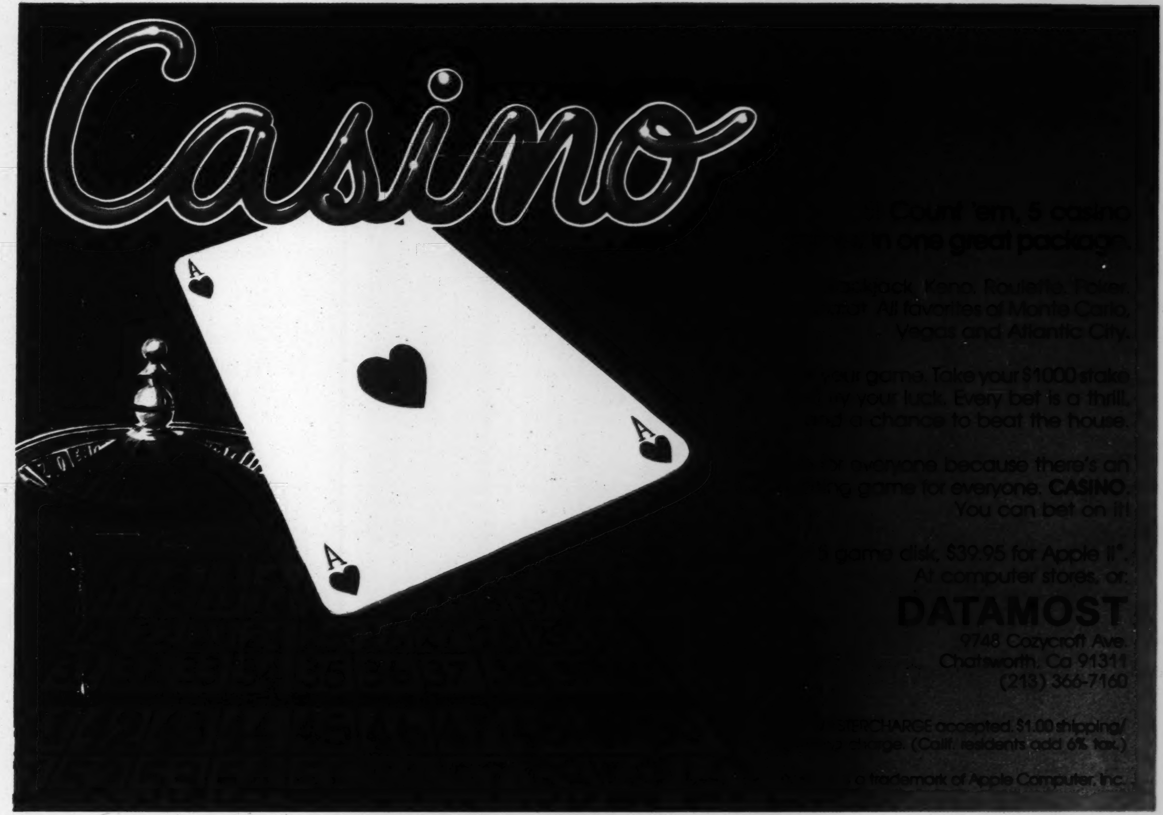
The Happ Adapter comes with a short program called Apple Bagpipes. After typing it in, you will be able to achieve a wide variety of different sounds by simply typing one key from the keyboard. Although the instructions do not state this, in order to try out different sounds, you must press reset and run the program again for each different sound. This program gives only a small sampling of the possible sounds available from the Apple. *Electric Duet* from InSoft and games such as *Juggler* or *Tumble Bugs* demonstrate a much wider range of possibilities.

The documentation included with the Hi-Fi Adapter was excellent, particularly the photographs which showed exactly how it was to be installed.

We found the device substantially enhanced the fun of playing games on the Apple and was well worth $25.



"I've decided that you, Mrs. Parks, get custody of the home video-game—and Mr. Parks gets to play it every other weekend..."



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Joysticks

Manufacturer	*Model/Name*	*Price*	*Size W x D x H*	*Table Top/ Hand Held*	*Potentiometer Resistance*	*Potentiometer Trim*	*Stick Size (in dia.)*	*Button Size (in dia.)*	*Button Placement*	*Tactile Feedback*
Joysticks, Potentiometer-type										
A2D	2001	$44.95	3.0 x 3.5 x 2.0	Both	150K ohms	Yes	0.4	0.6 sq	Rear side	Yes
Astar International	Robo Stick-1	29.95	2.6 x 5.0 x 1.7	Both	75K	No	0.75	0.4	Both sides rear	No
BMP Enterprises	Joystick	59.00	(1)							
CJM	Microstik	59.95	4.0 x 2.8 x 1.6	Table	110K	No	0.7	0.5 sq	Left top	No
Datamost	Joy Stick	59.95	2.1 x 5.0 x 1.8	Table	150K	No	0.75	0.3	Left top rear	No
The Keyboard Company	Joystick II	49.94	3.2 x 3.2 x 1.5	Both	150K	No	0.4	0.5 sq	Left top rear	Yes
Kraft	Joystick	64.95	(1)							
Syntronics	Applestix	34.95	(1)							
TG Products	Super Joystick	59.95	5.0 x 3.2 x 1.7	Table	150K	Yes	0.4	0.6	Left top	No
Zircon	Video Stik	49.95	2.5 x 5.3 x 1.6	Hand	90K	No	0.4	0.4	Left side rear	No
Joysticks, Switch-type										
Atari	Joystick	13.95	3.5 x 3.8 x 1.5	Both	-	-	0.6	0.6	Left top	No
Datasoft	Le Stick	39.95	1.5 dia x 5.0	Hand	-	-	n/a	0.4	Top	No
Newport	Prostick Series B	34.95	3.3 x 4.4 x 2.0	Table	-	-	1.0	0.5	Left Top	Yes
Zircon	Video Command	14.95	1.4 x 2.0 x 5.0	Hand	-	-	1.8	1.8	Top	No

(1) Not evaluated in this issue

Manufacturers of Joysticks, Paddles and Game Port Extenders

A2D Company
P.O. Box 6471
Greenville, SC 29606
(803) 297-0552

Astar International Co.
5676 Francis Ave.
Chino, CA 91710
(714) 627-9887

BMP Enterprises
(address not available)

CJM Industries
P.O. Box 2367
Reston, VA 22090
(703) 435-2991

Computer Works
Distributor:
Rainbow Computing
19517 Business Center Dr.
Northridge, CA 91324
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Datamost
9748 Cozycroft Ave.
Chatsworth, CA 91324
(213) 701-5161

Happ Electronics, Inc.
4640 Island View
Oshkosh, WI 54901
(414) 231-5128

The Keyboard Company
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Apple Computer Accessory
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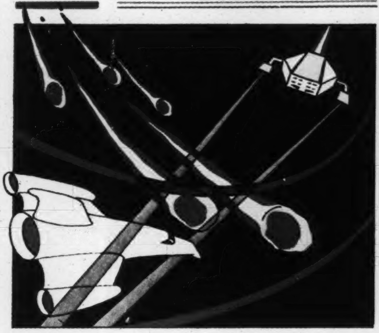

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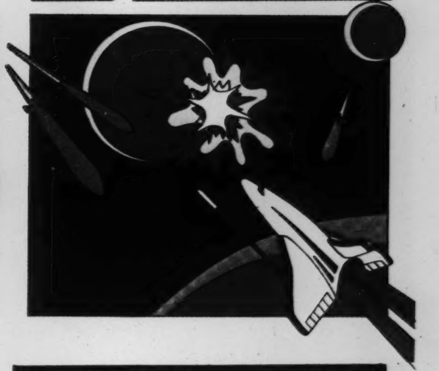

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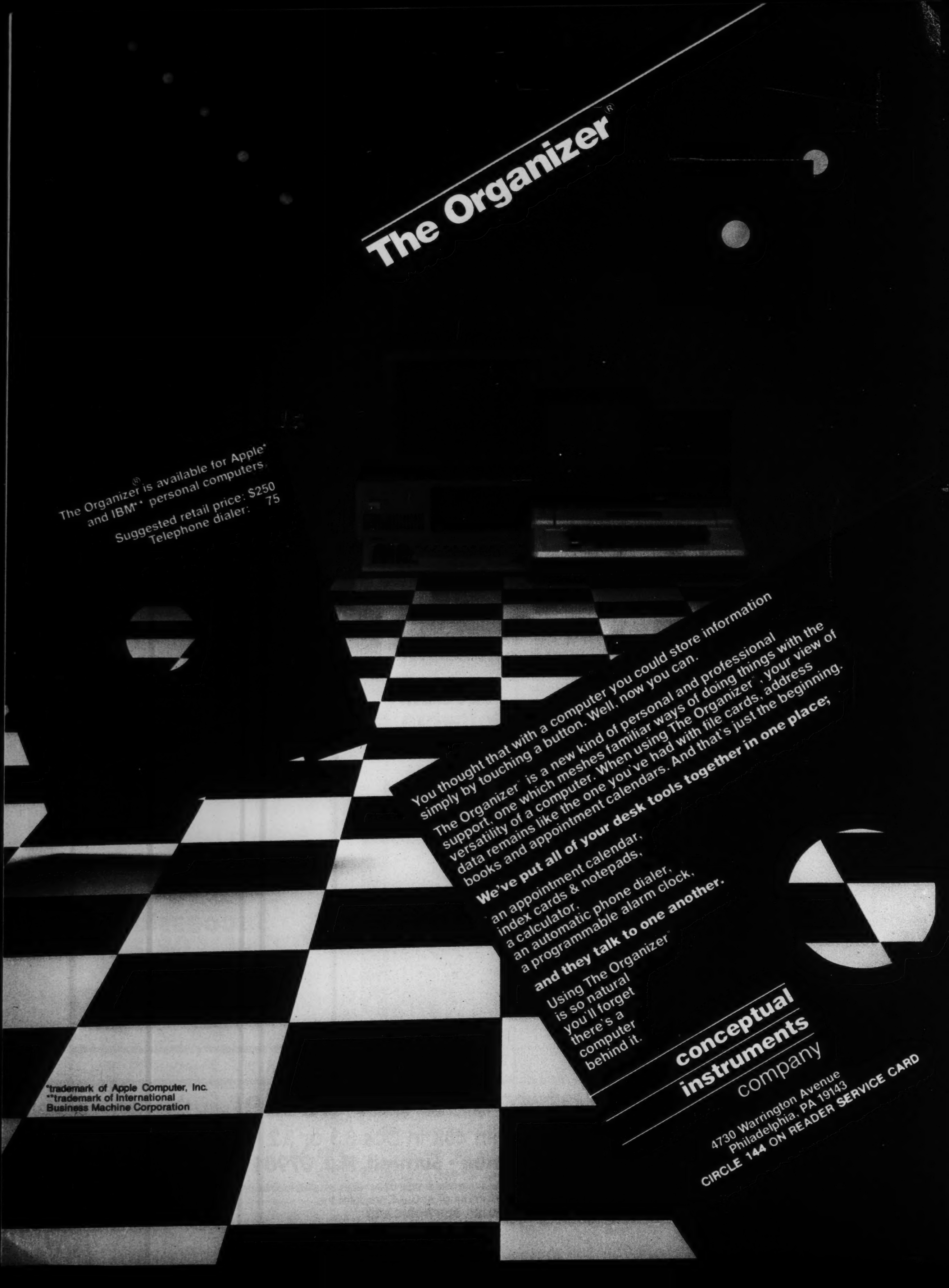

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Computer Games: A New Art Form?

Mark Bernstein

Walk into a computer store anywhere in this country and you will see computer games. Long after closing time, games flicker in the windows to attract and impress passers-by. Games outnumber all other commercial microcomputer programs, and fill the pages of computer magazines.

It is common to lament this situation — to apologize for the lack of "better" programs. Columnists and spokesmen eagerly point to the *useful* and *practical* new programs soon to appear. Critics expect computer games to be supplanted by home control systems, educational packages, and financial advice programs.

Still, the coming flood of non-game programs may appear in disguise. Games don't seem to be vanishing. They don't even seem to be losing much of their share of the software market.

The new wave of software, the "mature" programs which will convert the small computer from an avant-garde oddity into a common appliance, may look very much like game programs. Far from disappearing, game programs may well flourish.

Renamed, perhaps, as "educational simulations," they may remain the mainstay of the industry, and the route to the full realization of the computer revolution.

Games are fun because learning is fun. People play bridge and chess, they watch tennis or baseball, for the joy of facing and solving a problem. We all long to call the brilliant play, resolve the dilemma, out think the competition or drive in the winning run.

The problems of the nuclear engineer, the medieval cathedral builder, the Egyptian shipwright can all be explored at the keyboard.

We play games to experience new situations, to gain insight and skill, to live in new places and to taste imaginary dangers. Since people love to play, it is only natural that they use their computers to play.

The computer combines the virtues of prose and painting, film and music. It represents a new and powerful medium for artistic expression. As in any art and with any medium, though, the artist must know and understand the rules of grammar and the conventions of composition.

What makes a work of art intelligible and accessible to its audience? This is the fundamental problem of literary criticism. In the following, I will address a few suggestions to the programmer/artist.

Finding Game Ideas

Look for game ideas in likely and unlikely places. Because the computer can simulate almost anything, almost anything may be the subject of your efforts. With a computer to handle the game, rules may be frightfully complicated. Let the computer keep track and referee. The game board may be huge; display a piece at a time, and let the computer remember the rest. Complicated bookkeeping and scoring can be made easy. With a computer for a teacher, learning the rules can be a game in itself.

Games give precious insight into the worlds and problems of other people. With a computer, you can fly a a jetliner or a glider. For that matter, you can fly as a seagull over the oceans, searching for food, conserving your strength, avoiding storms and predators.

The problems of the nuclear engineer, the medieval cathedral builder, the

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Mark Bernstein, 12 Oxford St., Cambridge, MA 02138

Egyptian shipwright can all be explored at the keyboard. A game can be built on the foundation of any interesting problem.

Make Choices Plentiful and Important

Choice is the essence of a game. If a player is given no choice at all, the game becomes a ritual. Too many choices may bewilder and confuse. If the choices don't matter, the player wastes time making decisions of no consequence. If a single wrong move spells inevitable disaster, the game degenerates into a puzzle, lacking the flow and vitality of life.

Fine games are marked by plentiful, important decisions. In chess, many pieces may be moved, and many strategies employed. In baseball, the questions are everywhere: What pitch? Shift the outfield? Will he steal? Should he bunt? Who's on first?

Decisions should be vital. The tension and suspense of a fine game demand that any move have the potential for dramatic success or dreadful blunder, that every choice may hold the seeds of victory or defeat. Many factors should affect each decision, and each decision should affect many later decisions.

Sudden and dramatic reversals make a game inflame the spirit; slow and automatic progress makes a game dull and tedious. Of course, the game must have a logic and inertia of its own; a game that consists entirely of dramatic reversals soon degenerates into meaningless confusion.

Neatness Counts

A program should be well-wrought and finely crafted. Avoid sloppiness. Erase useless information from the screen. Check spelling and punctuation. Remember the limits of your display, and avoid long sentences that will push words off the edge of the screen. Use special symbols when you can, and use standard symbols, letters, and numbers creatively.

When possible, avoid letting your computer make mistakes that no human would make. The illusion that the computer is human is vital to many games, and is spoiled by sentences like:

```
You have 00 partridges
  in your pear tree.
```

A person, of course, would say, "You have no partridges."

Watch out for plurals; only a computer would say that

```
You have 001 points.
```

Some computer-style mistakes are hard to avoid; correcting others may require time or memory that could be better spent on another problem. In any case, elimination of the obvious pitfalls will impress your audience.

Design input efficiently. A "menu" or list of options emphasizes both the need for a decision and the issues that are involved. Simple routines sometimes allow the user to imagine that the computer actually understands English. Where the player is likely to be confused, permit him to ask the computer for help.

Check every command, and make the player correct impossible or illegal requests. Repeated illegal or nonsense commands probably indicate that the player is completely baffled; let the computer volunteer to help if it seems that the player can't figure out what he ought to do.

Always expect distractions and mistakes. Whenever possible, the display should tell the player three vital things:

- What he did last.
- What he is doing now.
- What he may do next.

Of course, the display should also include information relevant to any decisions the player must make, or instructions on how he may get such information before making a decision.

Let the player correct silly mistakes. Nothing is more frustrating than wrecking a carefully conceived plan, built up over hours of play, with a single typing error. Backspace and erase/rubout commands will help. Reviewing instructions and commands before they take effect is simple and effective, although somewhat cumbersome.

A blank, unchanging screen makes people nervous.

Beware of the STOP or RESET keys; disable them if possible to prevent accidents. Defeat of the RESET key is especially popular with teachers and store owners, who must otherwise waste time restarting the program after children or customers have sent the computer astray.

Use The Appropriate Speed

Some games are slow and thoughtful. Others are games of speed, coordination and reflex. The pace of the game determines the pace of the program and the speed with which the program must react to the player's requests and commands.

In speed games, the computer must appear to work instantly, without hesitation or delay. Input and output must be swift and efficient. Many compromises may be accepted to accommodate the computer, but speed must never be sacrificed.

In thought games, the computer may take more time. Pauses of several minutes, or even hours, may be perfectly acceptable. Convenience, authenticity, realism, and attractiveness may be allowed to consume time. But even in these games, the computer must not be *too* slow, lest the player grow bored waiting for it to respond. The computer is also an actor, and must hold its audience.

When writing slow games, make sure that the computer is always doing something that the player can see. A blank, unchanging screen makes people nervous. If nothing happens, the player wonders, "Has something gone wrong? Did the computer crash?" Draw a picture. Display the time, changing the clock every second. A beep or a flash will help reassure the player that the delay is normal.

Adjust As The Player Learns

Programs can be written flexibly, so that a wide audience may find them interesting and instructive. If a program is to be used frequently, it should be designed to adjust to the increasing skill of the operator.

When input is slow and full of detail, try to permit faster, abbreviated formats for the experienced user. For the same reason, simple and understandable input formats should be available for the new player.

The first-time player, especially if he is new to computers, will be willing to go slowly in order to avoid mistakes. The new user needs help; the experienced user wants speed. Try to accommodate both.

Some variables and rules may be removed from the game to create a special version for beginners. In addition to helping the new user, simple versions may make the game accessible to children and to those who would otherwise find themselves overmatched by the standard version.

Finally, the game scenario itself may be changed. New variables, new starting conditions, new opponent strategies may be introduced. Variety will extend the useful life of the game, and new combinations and scenarios enhance its educational value.

Select A Role For The Computer

Throughout a game program, the computer should play a single, consistent part. The player, sitting at his controls, may think of the computer as a person or a machine; choose a character for the computer, and stick with it.

If the computer is to play a person, whether an instructor, a guide, or an opponent, it ought to have a consistent, plausible personality. You need not exaggerate or be cute, but you needn't limit yourself to ungrammatical, mechanical, corporate dialogue.

The computer should be especially friendly if the player is likely to be unfamiliar with computers; many people are really very frightened of the computer at first.

If the role of the computer is machine-like, try to help the player believe he is operating the game-machine, not an everyday personal computer. If the player is supposed to fly an airplane, do your best to make him believe that the computer is the control panel of the plane.

If the player is the president of a large corporation, present information in the form of balance sheets, ledgers, and inter-office memoranda, and preserve a businesslike manner. If the player is a Babylonian slave, address him accordingly.

Violence

Always *think* about your subject. Ask yourself, "How should the player *feel* about all this?" And always remember that your game is a teacher, and your students may someday follow the precepts and prejudices you wrote into the program.

Violence and war are both terrible and fascinating. There are already many programs about combat; there will be many more. When looking for ideas, remember that war is not the only, or the best game.

Wars have happened. Some small ones are happening today. A very big one might happen again. If war is your subject, so be it. But remember what it is that you are writing about, and tell the player what is really going on.

Give your audience a feel for war as it really happens; not the sterile, prissy war of newsreels and propaganda, but War where knives slide through bone and flesh, and fires burn into the night.

Computer games will outlast the temporary glamor of their novelty.

The more you understand of battle, and the more you can communicate this understanding to the player, the better your game will be.

Avoid gratuitous violence. If you want to teach your audience about ballistic trajectories, baseballs and jumping fish are every bit as satisfactory as artillery shells. Don't hide real violence because it is ugly, but try not to add ugliness to a world which already has its share.

Games That Aren't Games

A good program should make you want to play with it. It ought to solve problems, suggest new possibilities, raise significant questions. There must be several dozen bookkeeping programs on the market today; does even one of these really teach the casual user about accounting? What about word processing programs that teach you how they are to be used? That correct your grammar? That help solve crossword puzzles? Useful, utilitarian programs may, to your surprise, turn out to be game programs.

In short, computer games will outlast the temporary glamor of their novelty. Eventually, they may become a new branch of literature. Great writing requires inspiration and genius; we may hope to achieve it, but it cannot be commanded. But competent, literate games are needed to satisfy an audience which is constantly growing and changing.

A program should be useful; it should teach us or relieve us of tedious and dull work. A program should be robust; nothing is worse than a program that constantly crashes. And a good program, *any* good program, should be fun. ☐

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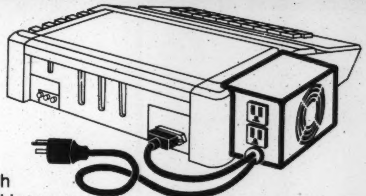

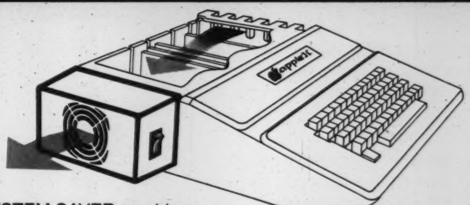

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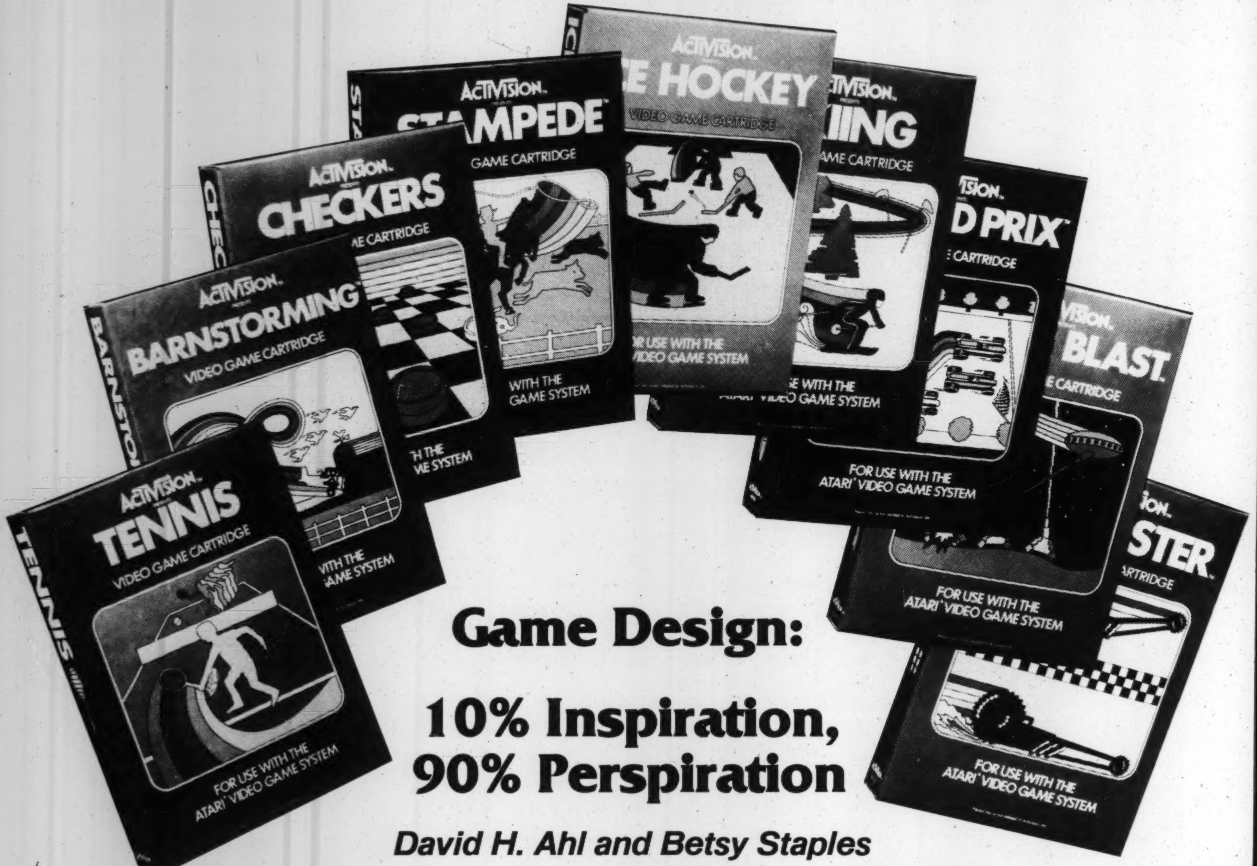


Game Design:

10% Inspiration, 90% Perspiration

David H. Ahl and Betsy Staples

Almost everyone plays computer games, and most of us have wondered at one time or another: "What sort of a mind does it take to create one of these things?"

We wondered, too, so we had a talk with three designers from Activision, a company which has had phenomenal success manufacturing and marketing games for the Atari Video Computer System.

Alan Miller, a senior designer, programmed Checkers, Tennis and Ice Hockey for Activision. We asked him to tell us about getting started—where does the idea for a game come from?

"Occasionally you have a brilliant thought—one that brings you right to the theme of the game. It is perfect; you can follow that thought and that theme all the way and implement it on the game system almost immediately."

How often does that happen? "Very rarely. Usually what happens is that you get stuck. You have just finished your last cartridge and you're thinking 'What am I going to do next?'

"You think for a couple of weeks and you come up with some ideas that you hope will work. Then you have to consider the technical limitations of the machine. Some of your great ideas simply can't be done. That probably eliminates about 90% of the ideas we have.

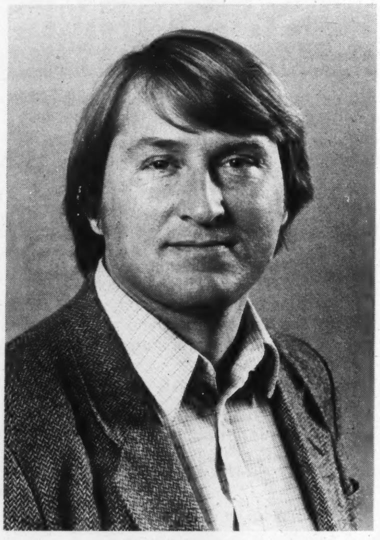
> ***"We try to put as much as we can into the program to provide as much as possible to the customer at as low a cost as possible."***

"But after a week or two you find an idea you are happy with and you begin to pursue it. That's when the real work starts."

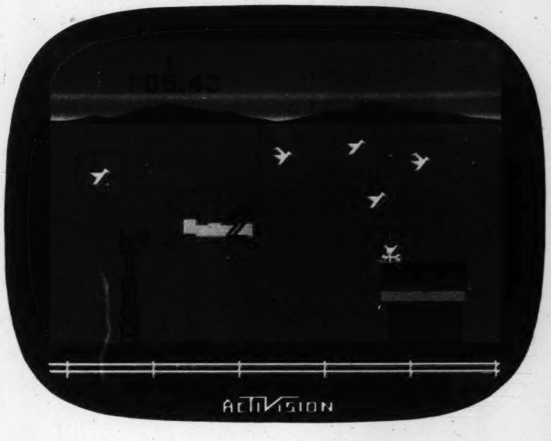
Tennis

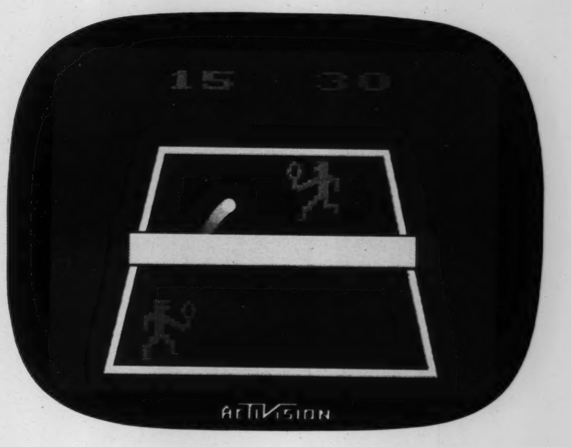
We asked Alan for some specifics. How, for example, did he go about programming the Tennis cartridge?

"Well, one of the best cartridges I did while working at Atari was Basketball. I particularly enjoyed working on the perspective aspect of the game design. I also enjoy playing tennis very much, so I put the two ideas together and decided to do Tennis.



Alan Miller.





"I knew basically what I wanted to do with the game when I started. It took about two weeks of intense work to create a display that would do what I wanted with the limited capabilities of the VCS.

"I then spent ten or twelve weeks working on the playability and polishing the game. That part of the design process is essentially an editing function—you expand on the good features and eliminate the bad ones."

One of the features in Tennis upon which players frequently remark is the shadow of the ball on the court. We asked Alan at what point he decided to add it. The shadow, he said, was part of the original game concept for Tennis.

"After Basketball was released, I got feedback from many people who said that they could not follow the motion of the ball as well as they wanted to. It occurred to me that adding the shadow would help make the perception of the perspective better.

"So, it was there from the beginning. It turns out to be a very trivial task to add it on the VCS. The critical thing is deciding whether or not to do it; you must realize that it is necessary."

We commented on the apparent high resolution of Tennis and several of the other Activision games, and wondered how it was achieved.

Alan responded, "We have learned no new secrets about the Atari VCS; we are using the same technical information that we have been using for the past four or five years. I think our success in getting the most out of the machine is attributable mainly to experience and hard work."

What about program size? Do they use more memory in the current cartridges than they did in the earlier ones?

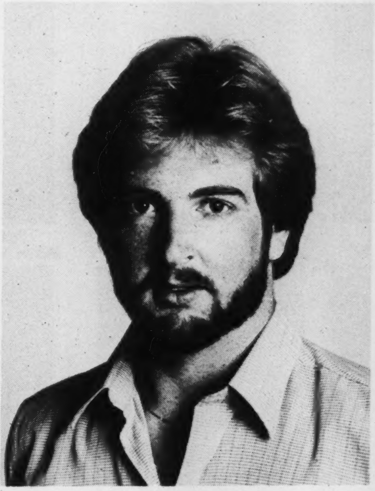
"In general, yes. Our programs in the early days were only 2K programs. We have recently gone to the 4K size because the expectations for video games have risen dramatically over the past year or two.

> ***"We find ourselves imagining everything we see around us as a video game."***

"Tennis is still in 2K—I did a lot of scrunching. I compressed my code, optimized it for space, and was able to put in five running graphics for the players and several different pictures of a swinging racket. This was in contrast to only two pictures of running graphics in Basketball."

Barnstorming

Steve Cartwright, author of Barnstorming, went to school with David Crane, one of the original Activision designers. Later, he worked for National Semi-Conductor.



Steve Cartwright.

"When Activision decided to expand their design staff, Dave thought of me. He thought I would fit into the group, that my personality would be similar to the other people in the group. I had the technical background, and he taught me some of the secrets of game design."

Was his work at National Semi-Conductor helpful in preparing him for his new job? "I worked on semi-conductors—nothing in software. I had a little software back in college, but nothing can prepare you for game design other than sitting down and doing it."

We asked him what the other designers had taught him—what sort of a learning process he had to go through. "Basically," he said, "these guys have been at it longer than anyone in the industry. They were among the original designers at Atari and they just have more experience to draw upon.

"They tried to teach me everything they had learned over the years, and spent some time comparing what was considered good a couple years ago with the current standards. The standards have improved a great deal because of little tricks they have learned to make the colors seem nicer, the graphics sharper, etc."

All of the programs on the VCS cartridges are, of course, written in machine language. How is writing a program for a game unit different from writing a machine language program for an Apple, PET, TRS-80 or other small computer, we asked.

Steve explained, "Since the Apple, PET and Atari VCS all use a 6502 processor, we're talking about the same assembly language. What we do with the VCS is to control on a very low level the video display hardware. The main difficulty we

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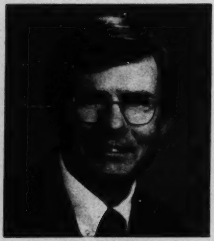
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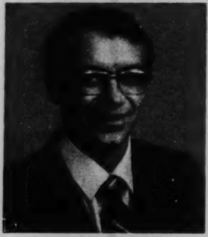
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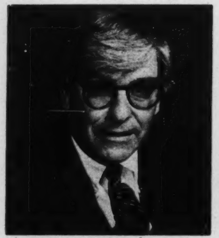
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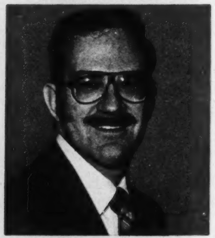
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have with VCS programming is that it is *very* time-critical—you must execute commands to the display hardware on a microsecond basis.

"We try to put as much as we can into the program to provide as much as possible to the customer at as low a cost as possible. We scrunch a lot into our code—something you don't have to do on other systems."

Barnstorming is different from any of the arcade games. We asked Steve how the idea for the game developed. "The idea came to me in about two seconds, but it took three months to translate that idea into a playable game.

"We are constantly coming up with and rejecting ideas," he said. "We find ourselves imagining everything we see around us as a video game." It just happened that it was possible to translate the idea of barnstorming into a game."

Making The Computer Intelligent

Carol Shaw, the newest member of the design team, is a Phi Beta Kappa with a master's degree in computer science. We asked her how she became involved with video games.

"My family always played lots of games," she told us. "We started with board games, and when the video games came out, we started playing them and fell in love with them."

Following her graduate work, she went to work for Atari because "it just seemed like a great job—playing games for a living."

Among the games she has programmed are Checkers and 3-D Tic, Tac, Toe. We asked how programming simulations of classic games differs from designing the action games for which Activision is famous.

"I have always been interested in making the computer intelligent, because that is something that you cannot get from a board game. You can actually have an intelligent opponent to play against. But it is not that different from Tennis, for example. In both cases you must concentrate on graphics and action as well as making the computer intelligent."

Carol told us that some of the routines used in the Checkers program she wrote for Atari were based on work done by Arthur Samuels in the 1950s. She explained that "the basic algorithm, which is called Alpha-Beta pruning, hasn't changed in all those years. The major improvements since then have been the result of faster processors rather than more intelligent algorithms."

Should You Quit Your Day Job?

What advice do these Activision game designers have for readers who are frustrated with their jobs and would like to be designing games instead?

Carol Shaw.

Alan advises becoming proficient in assembly language programming and asking friends for feedback on game ideas. "Our creative efforts are strongly influenced by the comments we get from our co-workers, friends and families; they give us good ideas. You must realize that you, as an individual, might not recognize the best things that can come out of your own game. And you may have to make compromises, because other people may view your game differently than you do."

It also helps to live in Silicon Valley, "where you can talk to people who have been involved in this business for five or ten years. It helps to have all the ideas going back and forth.

"The financial climate in and around the Valley is also more receptive to the formation of new companies. There is a sort of entrepreneurial spirit there; people are willing to take a risk and start a new company."

The Future Of The VCS

Is the design team interested in experimenting with games other than the action-type which has dominated their product line to date? What about fantasy or adventure games?

Alan replied, "Yes, but there are many technical limitations—adventure games are just plain hard to do on that system. The graphic display system is very simple and not set up for text."

Is it the hardware limitation of the processor or the amount of memory that can be built in? "The technical limitations to which I am referring are primarily in the display. I don't think memory size will be a limitation in future programs."

Do the programmers anticipate developing software for the new Atari System 5200?

"In the future," Alan replied, "Activision will supply entertainment software for any successful video game or personal computer. Only time will tell if the new Atari game will be a commercial success."

How do they feel about recent attempts to implement popular arcade games on the VCS?

"Atari, Coleco, Parker Brothers and several other companies have bought rights to some of the coin-operated arcade games. But you must remember that with a coin-op game you have between $1000 and $2000 worth of hardware to work with; you have a specialized screen and a specialized controller for each one. There is no way they can afford to put those sophisticated hardware controls in a home system; it is extremely difficult to duplicate the play value of an arcade game in a home game." ☐

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Eastern Front: A Narrative History

Chris Crawford

A common misconception among non-programmers is that a program is a static product, something that springs complete from the hand of the programmer. What they do not realize is that a truly original program like *Eastern Front 1941* does not leap out of the programmer's mind and into the computer.

It starts with an inspiration, a vision that sketches the outlines broad and clear but leaves the individual brushstrokes undefined. The programmer labors long and hard to translate this vision into a cybernetic reality. But the process of converting the pastels and soft shades of the vision into the hard and sharp lines of machine code inevitably produces contradictions among the fine details.

As many small ideas crystallize into a single whole, mismatches and discord are frequent. The programmer flits over the design, rearranging ideas, polishing rough edges, and reconciling differences. In this process many of the original ideas are warped and twisted until they no longer resemble their original forms.

It is very easy, on examining a program closely, to unearth many of these convoluted elements and conclude that the programmer lacks common sense. In truth, the only way to understand a program is to follow its evolution from start to finish. In this article I will narrate the history of the development of *Eastern Front 1941*. I hope that this will make the final product more understandable.

As many small ideas crystallize into a single whole, mismatches and discord are frequent.

Chris Crawford, 3603 Cosmic Way, Fremont, CA 94538.

Origins

Eastern Front 1941 began as Ourrah Pobieda in June of 1979. The original name is Russian for "Hooray for the Motherland!" and was the Russian war cry. The first title was retained until just before the program was finished; I was finally convinced that the simpler name would sell better.

Ourrah Pobieda was initially conceived as a division-level game of combat on the Eastern Front. The emphasis of the design was on the operational aspects of combat in that campaign. I wanted to demonstrate the problems of handling division-sized units.

The design placed heavy emphasis on the mechanical aspects of warfare. Thus, it had strong logistics and movement features. It also had a major subsystem dealing with operational modes.

The player could place each unit into one of many different modes such as movement, assault, reconnaissance in force, probing assault, and so on. Each mode had different combinations of movement capabilities, attack strength, and defense strength. There was also a provision for the facing of a unit that allowed flanking attacks.

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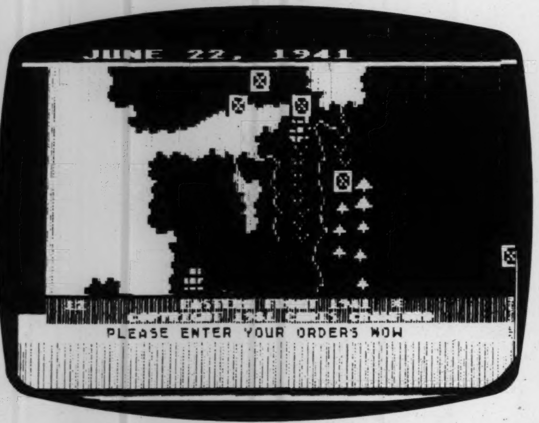

JUNE 22, 1941

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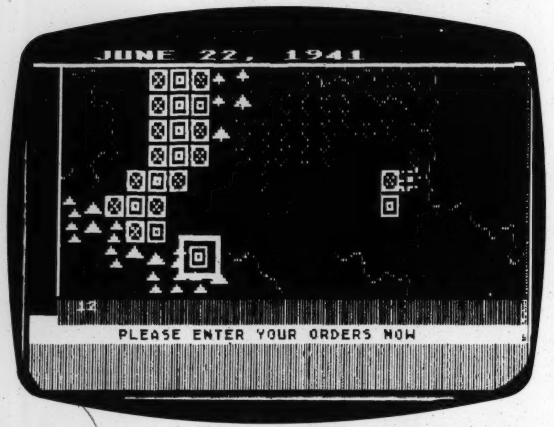
Figure 1. The opening display of Eastern Front shows the Baltic Sea, with two Finnish Infantry Units (German Allies) in Finland and three Russian infantry units. This black and white picture does not distinguish between the units, but the Russians are red and the Axis are white. The city in the top center of the screen, directly below a Russian unit, is Leningrad.



JUNE 22, 1941

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Figure 2. German and Russian units face each other in Central Poland. This display shows mountains, rivers, forests, marshes, and the city of Kiev, along with Russian and German Infantry and Armor units. The cursor is over a Russian Unit. Pressing the button would cause the unit to disappear, identifying the terrain underneath, and also display information on the unit; in this case, the 4th Russian Tank Army, a weak unit with a muster level of 79 and a current strength of 77.

I wrote the program in Basic on a PET computer in May and June of 1979. When I got the program up and running on the machine, I quickly realized that I had a dog on my hands. The game had many, many flaws. There were good ideas in it—the logistics routines, the combat system, and the movement system were all very good. But the game as a whole did not work. It was dull, confusing, and slow.

I wisely consigned all of my work to a file folder and started on a new design. Someday, when I had shaken off whatever preconceptions were contaminating my mind, I would come back to the game and start over with a fresh outlook.

Rebirth

Fifteen months passed. I went to work for Atari, programming first on the Video Computer System and then on the Home Computer. In September of 1980 I saw a program written by Ed Rothberg of Atari that finely scrolled the text window. It was a short demo that did no more than move characters around, but it shouted out its potential. I showed it to several other wargame designers and pointed out its implications for our craft. They listened politely but did not act on my suggestion that they use the capability.

Several weeks later I began to explore the fine scrolling capabilities of the machine myself. I took apart Ed's code and wrote a new routine that was more useful for me. I then generalized this routine to produce SCRL19.ASM, a demonstration scrolling module.

By mid-November I had completed SCRL19.ASM and was finishing up another wargame project. I was beginning to think about my next project. I decided it was time to pull out all the stops and do a monster game, a game with everything. It would be a 48K disk-based game with fabulous graphics.

> ***I also fought off the urge to rush the job. I spent four weeks just thinking.***

It seemed obvious that the Eastern Front was the ideal stage for such a game. I therefore began planning this new game. In the meantime, I began converting SCRL19.ASM to produce a map of Russia. This map was completed on December 10. It impressed many people, but it was only a map; it didn't do anything other than scroll.

Designing A New Game

Game design is art, not engineering. During December I took many long walks alone at night, sorting through my thoughts and trying to formulate my vision of the game clearly. I sifted through all of my old documents on the PET version of Ourrah Pobieda, trying to glean from that game the essence of all that was good and all that was bad. Mostly, I thought about what it would be like to play the game. What will go through the head of a person playing my game? What will that person experience? What will he think and feel?

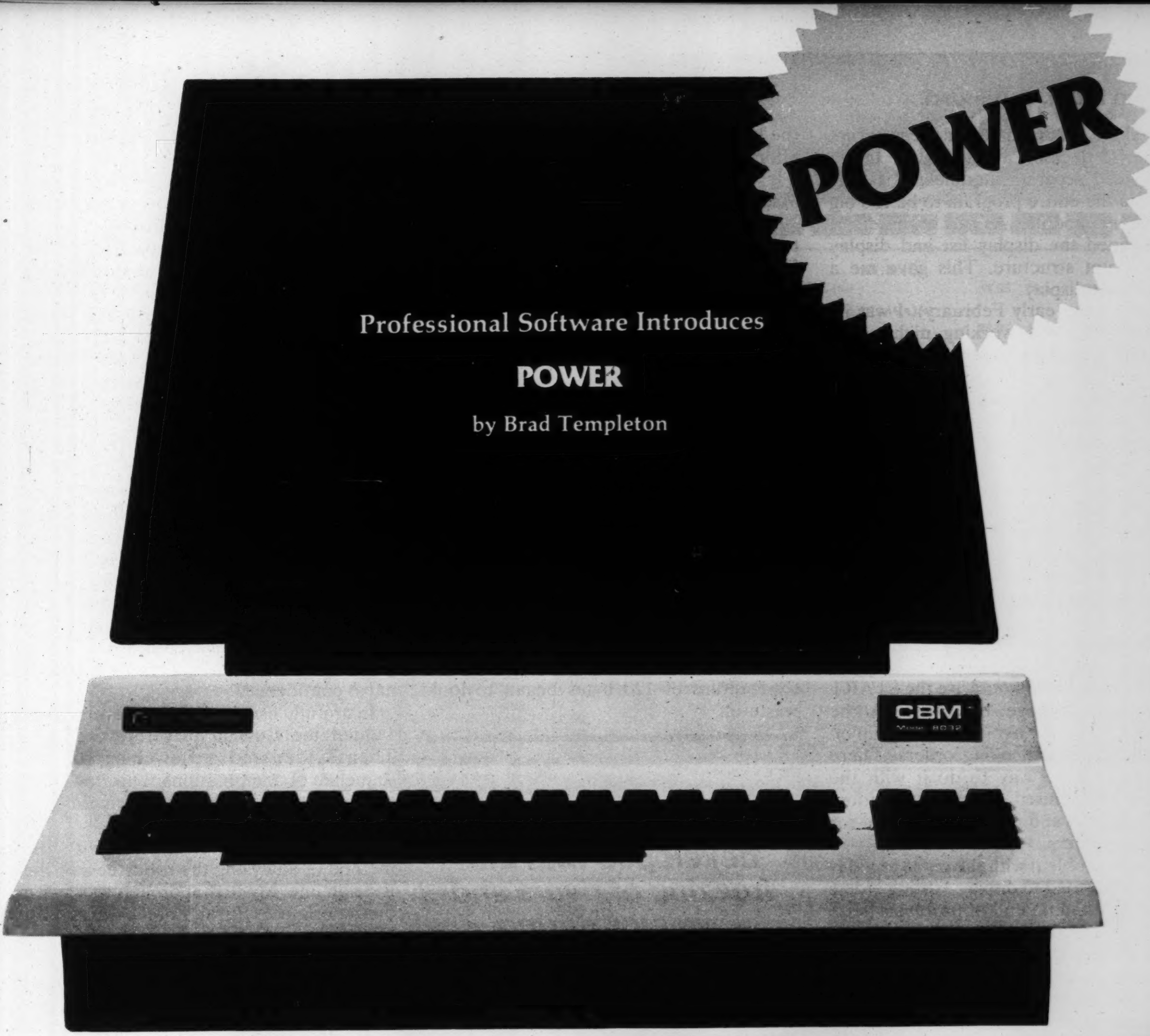
During all this time I never once put pencil to paper to record my thoughts. I deliberately avoided anything that would constrain creative flights of fancy. I also fought off the urge to rush the job. I spent four weeks just thinking. I didn't want to start designing a game that wasn't fully conceived.

Then, in January, the vision was clear. I knew (or thought I knew) exactly what the game would be like. I wrote a one-page description of it. The original document is a surprisingly accurate description of the final product. It specified the critical design and technical factors that would dominate the development of the game. I attached great importance to human interface and graphics. This reflects my belief that computation is never a serious problem but interface is always the primary concern.

Plunging Into The Morass

I now began the serious task of implementing the design. At first I proceeded slowly, cautiously. I documented all steps carefully and wrote code conservatively. I didn't want to trap myself with inflexible code at an early stage of the game.

First I rewrote the map routine, which



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involved the data module and the interrupt module. (I decided at the outset that I would need separate modules, as I fully expected the entire program to be too big to fit in one module.) As part of this effort I redesigned the display list and display list interrupt structure. This gave me a much better display.

By this time (early February), I was in full gear and was working nights and weekends—perhaps 20 hours per week. I made final changes in the character sets and nailed down the map contents.

Next came the unit displays. I wrote the unit display routine and began putting units on the map. They couldn't move or do anything, but they sure looked pretty.

In late February I began work on the input routines. So far everything had gone in smoothly. It had been a great deal of work, but most routines had worked properly on the first or second try. My first real headache came when I tried to design the input routines. I had decided that most of the game would be playable with only the joystick. The player would use the START key to begin a move, but otherwise the keyboard was to be avoided. I hung up on the problem of cancelling orders. There seemed to be no way to do it with the joystick. This caused great consternation. I finally gave in and used the space bar for cancelling orders.

My next problem with the input routines arose when I tried to display existing orders for a unit. I had no end of problems here. My original idea had been to use player-missile graphics to draw some kind of dotted path that would show the planned route for the unit instantly.

Unfortunately, there weren't enough players and missiles to do the job properly. It could only be done if I used a single dot for each square entered. I put the display up on the screen and decided that it did not look good enough. So it was back to the drawing board.

The solution I eventually came up with (after considerable creative agony) is the system now used—the moving arrow that shows the path of the unit. This takes a little longer but the animation effect is nice.

The Light At The End Of The Tunnel

By now it was early March and I paused to consider the pace of the effort. I could see how much effort would be needed to complete the game. I listed each of the remaining tasks and estimated the amount of time necessary for each. I then realized that the program would not be finished until late June. This was an unpleasant surprise, for I had been planning all along to unveil the game at the Origins wargame convention over the Fourth of July weekend. The schedule appeared to give me very little extra time in which to cope with unexpected problems. I did not like the looks of it. I resolved to redouble my efforts and try to get ahead of the schedule.

Mainline Module

With the input routines done it was time to work on the mainline module. The very first task was to take care of calendraic functions. I wrote the routines to calculate the days and months; this was easy. Next came the tree color changes with seasons; this was also easy.

The first problem developed with the freezing of rivers and swamps during the winter. I was unable to devise a simple way of doing this. I plunged into the problem with indecent haste and threw together a solution by force of effort.

The result was impressive, but I'm not sure I did the right thing. It cost me a week of effort, no great loss, and a lot of RAM, which at the time seemed inconsequential because I was still planning on the game taking 48K of memory. Later, when I chose to drop down to 16K, I found myself cramped for RAM, and the expenditure of 120 bytes began to look wasteful.

The first problem developed with the freezing of rivers and swamps during the winter.

Fortunately, I emerged from these problems unscathed. I was not tired yet, the project seemed on track and my morale was still high. Morale is important—you can't do great work unless you are up for it.

The next task was movement execution. This went extremely well. I had planned on taking two weeks to get units moving properly; as luck would have it, the routines were working fine after only one week. I was hot!

Combat Routines

As March ended, I was beginning work on the combat resolution routines. I had some severe problems here. My routines were based closely on the systems used for the original Ourrah Pobieda. After some thought, I began to uncover serious conceptual problems with this system.

A combat system should accomplish several things. It should provide attrition due to the intensity of combat. It should also provide for the collapse of coherence in a unit and its subsequent retreat. The routines I had were too bloody. They killed many troops by attrition but did not retreat units readily.

I analyzed them closely and concluded that the heart of the problem lay in the fact that combat was completely resolved in a single battle. This realization led me to the idea of the extended battle covering many movement subturns during the week. By stretching out the battle in this way I was able to solve the problem and achieve a much better combat system. I still retained the central idea of the earlier system, which divided the strength of the unit into muster strength and combat strength.

Artificial Intelligence

In early April I turned to the last major module of the project: the artificial intelligence routines. This module frightened me, for I was unsure how to handle it. Looking back, I cannot believe that I invested so much time in this project in the blithe expectation that the artificial intelligence routines would work out properly. I threw myself into them with naive confidence.

I carefully listed all of the factors that I wanted the Russian player to consider. Then I prepared a flowchart for the sequence of computations. This flowchart was subsequently rewritten many times as I changed the design.

My biggest problems came with the method of analyzing the robustness of the Russian line. My first approach was based on the original Ourrah Pobieba method. I started at one end and swept down the line looking for holes. When a hole was found I marked it and jumped onward to the other side of the hole. When the line was fully traced I sent reinforcements to the holes and weak spots in the line.

This worked in Ourrah Pobieda but would not work in the new program. The Russian line in the new program would be far more ragged than in the original game. In some places, the holes would be bigger than the line. In such cases, the algorithm would almost certainly break down.

A new algorithm was required. After many false starts, I came up with the current scheme, which broke the line up into small segments five squares wide. This five-square chunk was then applied to each unit in the Russian army, providing a kind of moving average to smooth the line and bind together the different units in the line. I am very proud of this design, for it is quite flexible and powerful in its ability to analyze a line structure.

An interesting aspect of this design is that I originally designed it to handle a smaller segment only three squares wide. After the code had been written, entered, and partially debugged I decided that it would work better with a five-square width. I modified the code to handle the new width in a few days. The transition was really quite clean. This indicates that I

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Within ten minutes I knew I had a turkey on my hands.

wrote the original code very well, for the ease with which code can be rewritten is a good measure of its quality.

First Startup

It was now mid-May. Six months had passed since I began to write the game. One evening, rather late, I finished work on the artificial intelligence routine and prepared to play the game for the first time. Many, many times I had put the game up to test the performance of the code, but this was the first time I was bringing it up solely to assess the overall design.

Within ten minutes I knew I had a turkey on my hands. The game was dull and boring, it took too much time to play, it didn't seem to hang together conceptually, and the Russians played a very stupid game.

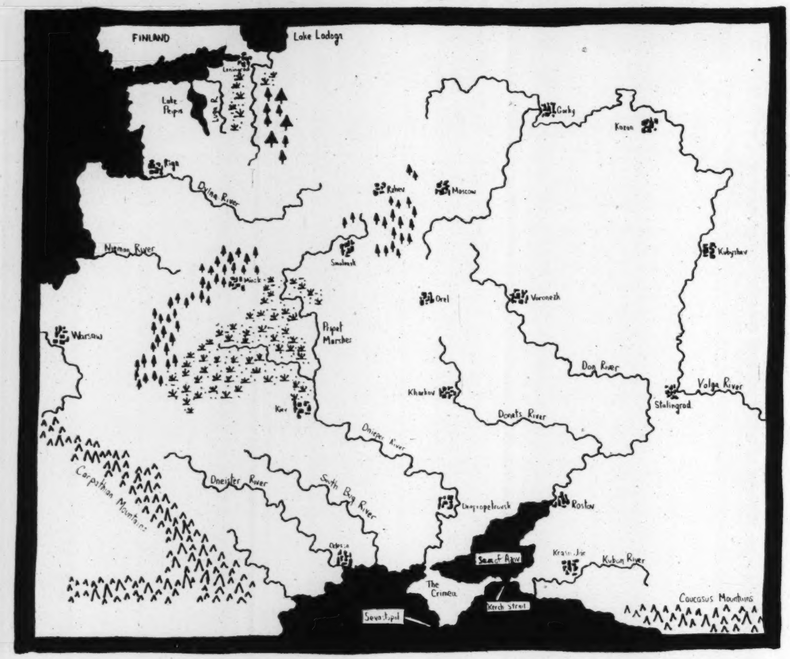


Figure 3. The instruction book contains a map of the whole area covered by the game. Only one tenth of this area is displayed on the screen at one time.

The Crisis

I remember that night very well. I shut off the machine and went for a long walk. It was time to do some hard thinking. The first question was: can the game be salvaged? Are the problems with this game superficial or fundamental to the design?

I decided that the game suffered from four problems: There were too many units for the human to control; the game required far too long to play; it was a simple slugfest with little opportunity for interesting ploys for the German; the Russians were too stupid. The second question I had to answer was, should I try to maintain my schedule, or should I postpone the game and redesign it?

That was a long night. One thing kept my faith: my egotism. Most good programmers are egomaniacs, and I am no exception. When the program looked hopeless, and the problems seemed insurmountable, one thing kept me going—the absolute certainty that I was so brilliant that I could solve any problem.

Deep down inside, every good programmer knows that the computer will do almost anything if only it is programmed properly. The battle is not between the programmer and the recalcitrant computer; it is between the programmer's will and his own stupidity.

Only the most egotistical of programmers refuses to listen to the "I can't do it" and presses on to do the things which neither he nor anybody else thought possible. But in so doing, he faces many lonely nights staring at the ceiling, wondering if maybe this time he has finally bitten off more than he can chew.

I threw myself at the task of redesigning the program. First, I greatly reduced the scale of the program. I had intended the game to cover the entire campaign in the East from 1941 to 1945. I slashed it down to only the first year. That suddenly reduced the projected playing time from a ridiculous 12 hours to a more reasonable 3 hours.

I then drastically transformed the entire game by introducing zones of control. Before that units were free to move through gaps in the line at full speed. This single stroke solved a multitude of problems.

First, it allowed me to reduce greatly the unit count on both sides. One unit could control far more territory now, so fewer units were necessary. With fewer units, both players could plan their moves more quickly.

Second, Russian stupidity was suddenly less important. If the Russians left small holes in the line, they would be covered by zones of control. Third, it made encirclements much easier to execute, for large Russian forces could be trapped with relatively few German armored units.

My third major change to the game design was the inclusion of logistics. I had meant to have supply considerations all along, but I had not gotten around to it until this time. Now I put them in. This alone made a big change in the game, for it permitted the German to cripple Russian units with movement instead of combat. Indeed, the encirclement to cut off supplies is the central German maneuver of the entire game.

It was about this time that I also committed to producing a game that would run on a 16K system. I had suspected since April that the entire program would indeed fit into 16K but I did not want to constrain myself, so I continued developing code with little thought for its size. Yet it is hard to forget one's upbringing. I had learned micros on a KIM with only 1K of RAM, later expanded to 5K. I had written many of my early programs on a PET with 8K of RAM, later 16K. I had written programs at Atari to run in 16K. My thoughts were structured around a 16K regime. When the first version of the program ran in May, it fit in almost exactly 16K. I never took anything out to meet the 16K requirement; I simply committed to maintaining the current size.

Frantic June

During the first two weeks of June I worked like a madman to implement all of these ideas. The structure of the program went to hell during this time. I was confident of what I was doing, and was willing to trade structure for time.

I had all the changes up and running by mid-June. It was then that I released the first test version to my playtesters. I also began the huge task of polishing the game, cleaning out the quirks and oddities. This consumed my time right up to the Origins convention on July 3-5. We showed the game to the world then, and it made a favorable impression on those who saw it. The version shown there was version 272. It was a complete game, and a playable game, and even an enjoyable game, but it was not yet ready for release.

The Polishing Stages

Two of the most critical stages in the development of a program are the design stage and the polishing stage. In the former, the programmer is tempted to plunge ahead into coding without properly thinking through what he wants to achieve. In the latter, the programmer is exhausted after a major effort to complete the program. The program is now operational and could be released; indeed, people are probably begging for it immediately. The temptation to release it is very strong. The good programmer will spurn the temptation and continue polishing his creation until he knows that it is ready to be released.

Polishing occupied my attention for six weeks. I playtested the game countless times, recording events that I didn't like, analyzing the flow of the game, and above all looking for bugs.

I found bugs, too. One by one, I exterminated them. I rewrote the zone of control routine to speed it up and take less memory. I made numerous adjustments in the artificial intelligence routines to make the Russians play better.

> ***Every designer will build personal quirks into a game that can only hurt the design.***

Most of my efforts were directed to the timing and placement of reinforcements. I found that the game was balanced on a razor-edge. A good player would have victory within his reach right up through December, but then the arrival of a large block of Russian reinforcements would dash his chances. I spent a great deal of time juggling reinforcements to get the game tightly balanced.

During this time playtesters were making their own suggestions for the game. Playtesters are difficult to use properly. At least 90 percent of the suggestions they make are useless or stupid. This is because they do not share the vision that the designer has, so they try to take the game in very different directions.

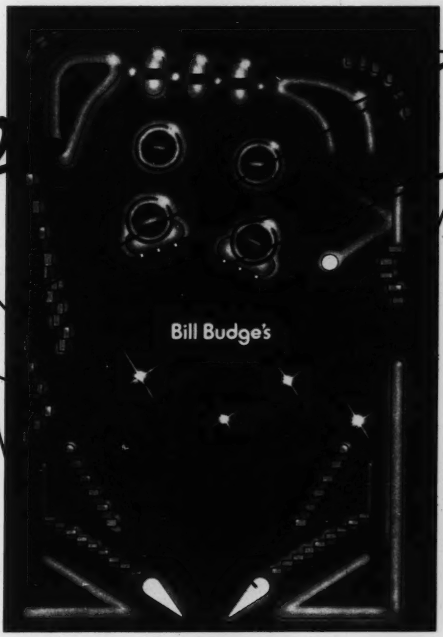
The tremendous value of playtesters lies in that small 10 percent that represents valuable ideas. No designer can think of everything. Every designer will build personal quirks into a game that can only hurt the design. The playtesters will catch these. The good designer must have the courage to reject the bad 90 percent, and the wisdom to accept the good 10 percent. It's a tough business.

Delivery And Aftermath

I delivered the final product to Dale Yocum at the Atari Program Exchange around the 20th of August; it was the 317th version. The program went on sale 10 days later, and has been generating favorable response ever since. I was not able to embark on a new project for ten weeks; I was completely burned out. I do not regret burning myself out in this way; anything less would not have been worth the effort. □

Bill Budge's

Raster Blaster



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CIRCLE 105 ON READER SERVICE CARD

A Style Manual for Authors of Software

Kevin Mackey and Twila Slesnick

Although the authors wrote the following guidelines with educational applications in mind, their suggestions are equally appropriate for business, recreational and general programs.

In the wake of rapid developments in computer technology, creators of software are scrambling to fill the need for programs to be used with each new computer. There is now an abundance of software. Only a small percentage of it is educational and the quality of these programs varies dramatically.

This is largely because educational programs have been written by hobbyists, educators, publishers, software companies, and computer companies. There is no consistent format, standard, or quality. This can make the programs difficult to use and understand.

The following is a list of program standards established at the Lawrence Hall of Science. This list can serve as a guide for people who are writing or modifying programs for use in informal as well as formal settings. For the most part, these standards are computer independent, and therefore could apply to programs written for any computer.

The Beginning of the Program

1. Have remark (REM) statements at the beginning of the program to identify and describe it. External documentation may be lost, so it is necessary that a program contain its own. The REM statements should include the following information:
   a. Program name.
   b. One line description of the program.
   c. Computer for which the program is written. (Note the model or ROM version, when appropriate.)
   d. Minimum amount of memory (in K bytes) required to run the program. (Include memory needed for variables.)
   e. Language or language version (e.g., Integer or Applesoft).
   f. Special peripherals needed (joysticks, paddles, printer, disk).
   g. Files used (e.g., on Apple, which fonts, machine language subroutines, etc., are read in from files).
   h. Author(s) or author's organization.
   i. Address of author or author's organization.
   j. Date written.
   k. Copyright statement or statement of permission to copy.
   l. Modifications made.
   m. Author of modification.
   n. Date of last modification.
2. Set the mode of the computer as needed. For example, if you are going to use graphics and uppercase letters on the PET, the computer must be set for that mode. On the Apple, you will need to set up the text page if you are going to print text. Do not assume the computer is already set correctly for the program.
3. Clear the screen so that remnants of other programs are not visible when the user begins.
4. Print the name of the program along with a greeting (e.g., "Welcome to the game of Caves"). This will allow the user to verify which program is in the computer.

Use diagrams for explanations whenever possible.

5. Ask the user if he would like to see the instructions. If the user is familiar with the program, he may want to skip the instructions.

Instructions

6. Double space the text so that it is easier to read.
7. Limit instructions to three screen pages in length.
8. Use diagrams for explanations whenever possible.
9. Have a character (e.g., "B" for back) that allows the user to go back to the previous page of instructions.
10. After the instructions are printed, ask the user if he wants to use the program (e.g., "Do you want to play?"). After seeing the instructions he may not want to try it. If you do not want the user to have a choice, omit this step.
11. Include reminders throughout the program about how to play. For example, if the user is to enter a coordinate, the program might remind him to enter two numbers separated by a comma.

Kevin Mackey and Twila Slesnick, University of California, Lawrence Hall of Science, Berkeley, CA 94720.

Input

12. Use input routines rather than input statements. The Basic input statement has several pitfalls which can be avoided. Your routine should:

a. Clear the keyboard buffer before receiving input. Previously typed characters may be mistakes, so they should be ignored.

b. Prevent the program from ending if the user presses the Return key without having input any information.

c. Prevent the user from deleting too many characters when correcting his errors (i.e., users should not be able to delete the text of the program).

d. Screen out characters that would clear the screen, home the cursor, or move the cursor if the user typed them.

e. Limit the number of characters the user may input. For example, if you want to accept a maximum of nine characters, the user should not be able to enter more than nine characters.

f. Have the cursor move to the left and erase one character at a time when the user is deleting errors. Characters printed to the right of the cursor should not be dragged to the left as the cursor moves.

13. Have the program wait for the user to press Return after his input, rather than going on with the program as soon as any key is pressed.

Allow the user to watch his own progress through an activity.

14. Check the input for errors. If errors are made, print an explanation of the error and then ask for the input again. For example, if a user enters a letter instead of a number, an error message might say, "Remember, you can only use numbers."

15. Allow enough room after a question (e.g., "What is your name?") for the input to be typed without wrapping around to the next line.

16. For Yes/No questions, check only the first letter that is entered. If it is not "Y" or "N," ask the user to type "YES" or "NO" and then repeat the original question. This allows the user to enter either the whole word or just the first letter.

17. Check for errors the program might make as a result of user input (e.g., dividing by zero, string overflow, etc.). Give an error message to the user at the time of input.

Throughout the Program

18. Use a page format when printing to the screen instead of scrolling or using timed displays to allow people to read at their own rates. This format should:

a. First clear the screen.

b. Print at most one screen of text. (Be careful not to print so much that the text scrolls.)

c. Save the last line of each page for printing error messages or prompting messages such as, "Please press the Space bar to continue."

d. Go to the next page when the Space key is pressed.

e. Scroll only when necessary. For instance, when writing a story, the user may want to see not only the last line he wrote, but several preceding lines as well.

19. Use the Space bar for prompting (having the user tell the computer when he is ready to continue). This key is large, and rarely used for anything else. Do not use timed displays.

20. Begin and end words on the same line. Do not hyphenate them or have them begin on one line and end on another (wraparound).

21. Allow enough room in PRINT statements for printing values of variables without disturbing the output format (i.e., do not cause wraparound).

22. Allow the user to return to the instructions, stop the activity, or restart the program at intervals throughout the program.

23. When the program is going to take some time to make calculations or fill an array, print a message on the screen asking the user to wait.

24. Allow the user to watch his own progress through an activity when appropriate. In guessing games, for example, the user should be able to see his previous guesses to help plan the next guess.

The End of the Program

25. After the activity, ask the user if he wants to try the program again. Allow him to change the conditions (e.g., difficulty level, time limit) if he wants.

26. When the user finishes or interrupts the activity, have the program:

a. Clear the screen.

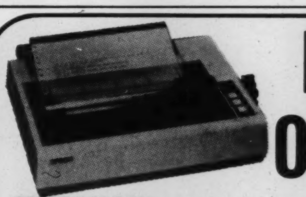
b. Comment on user performance, if appropriate.

c. End, leaving comments on the screen and placing the cursor on a clear line so that a command can be entered; or

Ask the user to press the Space bar and then run a menu program which lists the names of the available programs.

The above standards reflect an attempt to make programs self-explanatory, easy to understand and use, and relatively free of bugs. We welcome suggested additions to this list.

Those readers who are interested in other articles on program standards might look at Berentson and Ahl's "Sesame Place Style Manual" in *The Computing Teacher*, September 1979; and "Microcomputer Software Development: New Strategies for a New Technology" by Kehrberg in *AEDS Journal*, Fall 1971. ☐



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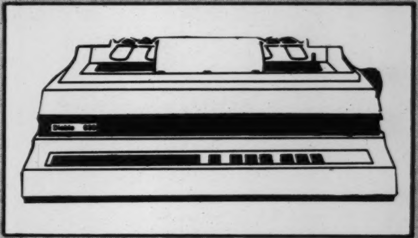

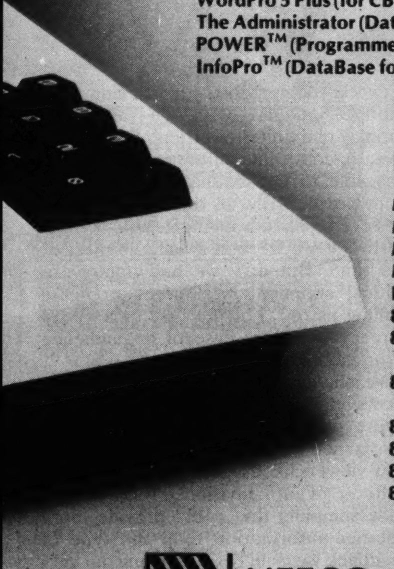

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Source Subscribers Air Their Thoughts on TV Programs

Cary Pepper

For three months last year, if Source subscribers didn't like something a character did on NBC's "Hill Street Blues," or particularly enjoyed an episode of "Simon & Simon" on CBS, the means to make their opinions known was only as far away as their computer and an electronic letter to "Simon & Simon" executive producer Phil DeGuere.

"The whole thing came about as an accident," comments DeGuere. "I'd been interested in integrating computers into stories for some time...I knew an early episode of the show would concern itself with computer crime and I wanted to know how computer people would react to it...I figured The Source was ideal for doing this."

He began by dropping messages on Source bulletin boards such as "APPLE," "VIDEO" and "TV," inviting fellow computerists to comment on the show and make suggestions for improving its contents. Before he knew it, "I started finding 15-20 letters in my electronic mailbox every morning."

DeGuere owns two computers (a Compal 8200 word processor for his office at Universal Studios and an Apple II at home), on which he writes scripts and keeps track of production budgets.

It seems natural to try putting together his professional needs and personal interests. "The whole idea of one complete network—computerists—interfacing with another network—CBS—became fascinating," and quite rewarding. Because of coast-to-coast time differences, DeGuere was able to get feedback on his show from people living in the East before it was even seen in Los Angeles.

> ***DeGuere sees computers as a tool to break the "stranglehold" the networks now have on information, research and decisions.***

"In TV we work in a vacuum most of the time...But now we had immediate critical commentary...Perfect strangers 'calling us up'...For the first time in my career we had a sense of an audience *during* a broadcast."

Next he started putting news of upcoming shows on The Source to solicit ideas about future plots and characters. Eventually he planned to ask questions as specific as how viewers liked a particular character's haircut. "What I envisioned was a nationwide sampling that could provide more detailed information than the type of feedback we usually get, spelling out very specific likes and dislikes...The Nielsen ratings never have—were never designed to—reflect whether people *like* a given show. They reveal only whether they're

---

Cary Pepper, 10 Ocean Parkway, Brooklyn, NY 11218.

watching...Thanks to The Source and the computer, I got some sense of an active audience out there."

DeGuere invited the producers of "Hill Street Blues" to join him and found "a tremendous volume" of response to that show.

The first week of the "experiment," as DeGuere calls it, over 100 responses came in. The next week the number doubled. Considering that The Source has over 14,000 subscribers and the Nielsen system uses a viewer sample of 1,250, speculation began to emerge that this was a new rating system in the making.

It never went quite that far, however. Lasting only three months, from mid-October to mid-January, the project involved only a few hundred viewers. Even so, "there was a real sense of nation-wide participation," DeGuere observes.

And the producer feels it could have worked even better if he had had more cooperation and support from The Source. It seems there was some difficulty with a promised sign-on message, and users had to know DeGuere's personal I.D. number to criticize and rate the show.

But DeGuere remains undaunted and eager to try his experiment again. He envisions a future in which an independent TV producer finances his plot himself, airs it on cable TV, and uses this computerist network to poll his potential audience. Then he would be able to offer a network not only the show, but the demographics for it, already tabulated, with a complete breakdown of who would watch the show, where, and even why.

Thus, DeGuere sees computers as a tool to break the "strangle-hold" the networks now have on information, research and decisions. Today each network uses its own closely-guarded methods of market research to dictate changes to the producer.

Simon & Simon *co-stars Gerald McRaney (left) and Jameson Parker.*

Using computers, a producer could do his own research according to his specific needs and thereby regain some of the control DeGuere feels has been lost. As he went along, he said, "I began to see a way for the creative community to regain some control."

As for replacing the Nielsen ratings, DeGuere is all in favor: "The national consciousness is being strangled by its adoration of the Nielsen ratings...We have become a nation of Nielsen watchers," he feels.

He is now in the process of having special programs written to sift through the data he has gathered so he can break it down in terms of demographics, and analyze critical responses. One project being planned will compare computer responses with regular fan mail.

Comments Source Manager of Corporate Communications, Mike Rawl, "like so many of the services and opportunities on The Source, this is just a taste, a forerunner of what this technology will be able to do for us."

So keep your computer handy. In the near future you may play a major part in determining who shot J.R. □

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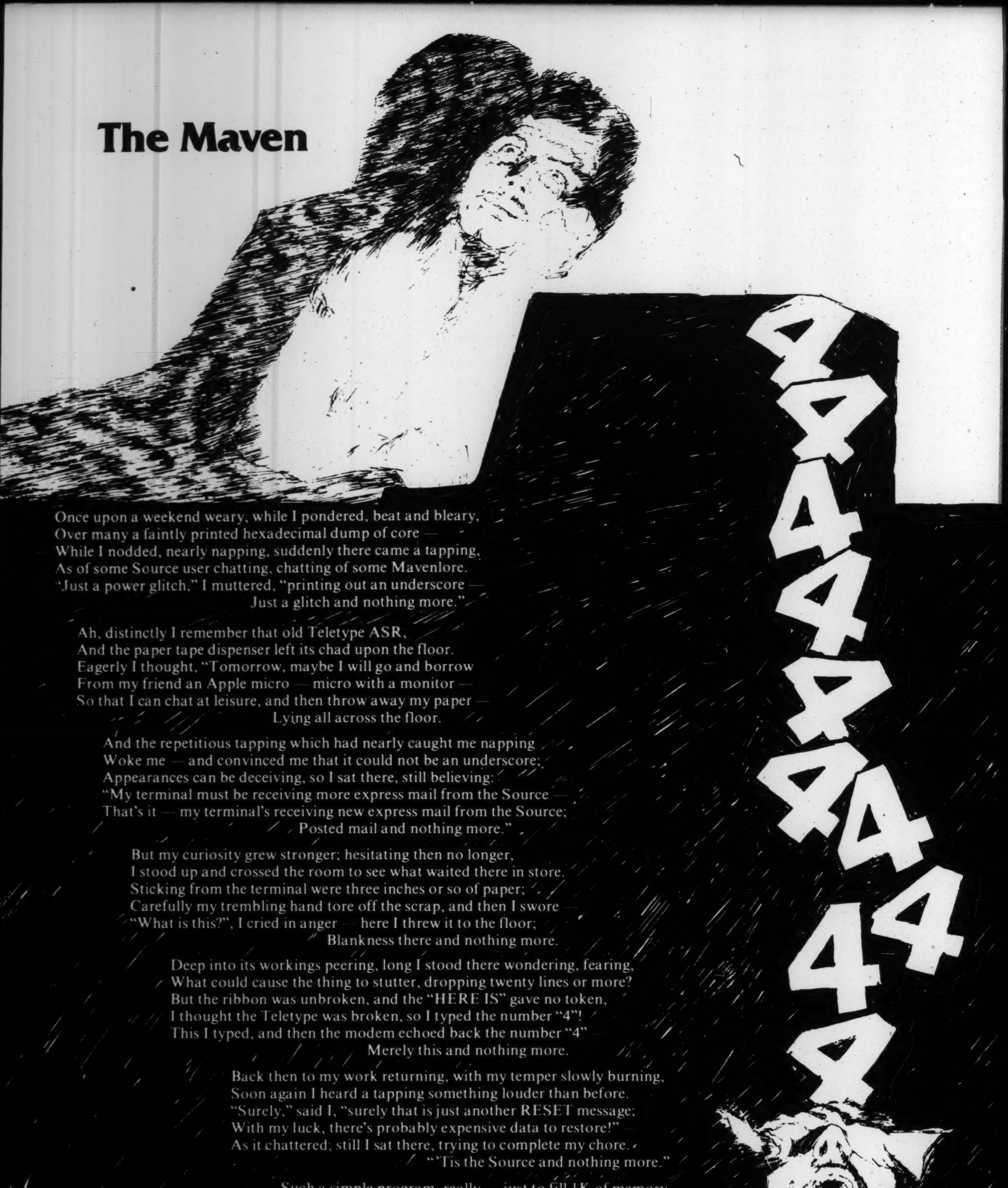
The Maven



Once upon a weekend weary, while I pondered, beat and bleary,
Over many a faintly printed hexadecimal dump of core —
While I nodded, nearly napping, suddenly there came a tapping,
As of some Source user chatting, chatting of some Mavenlore.
"Just a power glitch," I muttered, "printing out an underscore —
Just a glitch and nothing more."

Ah, distinctly I remember that old Teletype ASR,
And the paper tape dispenser left its chad upon the floor.
Eagerly I thought, "Tomorrow, maybe I will go and borrow
From my friend an Apple micro — micro with a monitor —
So that I can chat at leisure, and then throw away my paper —
Lying all across the floor.

And the repetitious tapping which had nearly caught me napping
Woke me — and convinced me that it could not be an underscore;
Appearances can be deceiving, so I sat there, still believing:
"My terminal must be receiving more express mail from the Source —
That's it — my terminal's receiving new express mail from the Source;
Posted mail and nothing more."

But my curiosity grew stronger; hesitating then no longer,
I stood up and crossed the room to see what waited there in store.
Sticking from the terminal were three inches or so of paper;
Carefully my trembling hand tore off the scrap, and then I swore —
"What is this?", I cried in anger — here I threw it to the floor;
Blankness there and nothing more.

Deep into its workings peering, long I stood there wondering, fearing,
What could cause the thing to stutter, dropping twenty lines or more?
But the ribbon was unbroken, and the "HERE IS" gave no token,
I thought the Teletype was broken, so I typed the number "4"!
This I typed, and then the modem echoed back the number "4" —
Merely this and nothing more.

Back then to my work returning, with my temper slowly burning,
Soon again I heard a tapping something louder than before.
"Surely," said I, "surely that is just another RESET message;
With my luck, there's probably expensive data to restore!" —
As it chattered; still I sat there, trying to complete my chore.
"'Tis the Source and nothing more."

Such a simple program, really — just to fill 1K of memory
With the Fibonacci series, but when it reached 144,
It had failed to set the high bit — suddenly, I thought I had it!
But, just as I found the bug, my train of thought derailed once more
And the Teletype's loud bell rang, then it sat just like before
Rang, and sat, and nothing more.

Suddenly, I couldn't stand it — Just as if someone had planned it,
Now the paper, like a bandit, rolled its way across the floor!
As I put it back, I spied two words: CHAT TCX122 —
Which I knew must be the Maven, chatting from the Eastern shore.
Presently the terminal received and printed one word more —
Quoth the Maven, "#4?"

Such a message I was having difficulty understanding,
For his letters little meaning — little relevancy bore:
Though I must admit believing that no living human being
Ever could remember seeing evidence of Mavenlore —
Tell me now, what kind of Maven of the saintly days of yore
Could have written "#4?"

But the Maven, waiting for me to reply, transmitted only
That one word, as if his soul in that one word he did outpour.
Nothing farther then he ventured; silently the Teletype purred —
Till I scarcely more than murmured: "Stars and garters, what a bore!" —
Whereupon the terminal abruptly started with a roar;
Then it typed out, "#4?!"

Startled at the stillness broken by reply so tersely spoken,
"Doubtless," said I, "what we have here could not be a line error.
Failure to communicate, perhaps — it's late and getting later —
But I've never seen a greater unsolved mystery to explore."
Then I knew I'd never rest until I solved his semaphore . . .
"Who am I, the Prisoner?"

But the Maven didn't answer; no more data did he transfer,
So I wheeled my Herman Miller office chair across the floor;
Then upon the plastic sinking, I betook myself to linking
Logic unto logic, thinking what this ominous bard of yore —
What this unknown, unseen, unsung, unrepentant bard of yore
Meant in typing "#4?!"

This I sat engaged in guessing, but no syllable expressing
To the dour and cryptic Maven now whose words I puzzled o'er;
This and more I sat divining, with my head at ease reclining
On the seat back's plastic lining that the lamp-light fluoresced o'er,
But whose flattened plastic lining with the lamp fluorescing o'er
Shall compress, ah, little more!

All at once my thoughts grew clearer — as if looking in a mirror,
Now at last I understood where I had sent the number 4!
"Look," I typed, "I was just testing — did you think that I was jesting?
Why was it so interesting that I typed the number 4?
Did you think that you were chatting to some foolish sophomore?"
Quoth the Maven, ". . . #4?"

"Maven!" said I, "Great defender! Venerable comprehender!
Whether you began this chat, or were a victim of error,
Mystified, and yet undaunted, by this quandary confronted," —
(Could my terminal be haunted?) — "tell me truly, I implore —
Can you understand my message? — tell me, tell me, I implore!"
Quoth the Maven, "#4!"

"Maven!" said I, "Great pretender! Ancient Jewish moneylender!
By the Source that now connects us — by the holy Oath you swore —
Tell me in your obscure wisdom if, within your distant modem,
You receive my words unbroken by backspace or underscore —
Tell me why my Teletype prints nothing but the number 4!"
Quoth the Maven, "#4?"

"Be that word our sign of parting, bard or friend!" I typed, upstarting —
"Get back to your aimless chatter and obnoxious Mavenlore!
Leave no token of your intent — send no message that you repent!
Leave my terminal quiescent! — Quit the chat hereinbefore!
Type control-P (or escape), and quit this chat forevermore!"
Quoth the Maven, "#4 . . . "

And the Maven, notwithstanding, still is chatting, still is chatting
Over my misunderstanding of his cryptic "#4?";
And I calmly pull the cover and remove a certain lever
From the 33ASR, which I never shall restore;
And a certain ASCII number that lies broken on the floor
Shall be printed — nevermore!

(with no apologies whatsoever to anyone) . . . the Dragon

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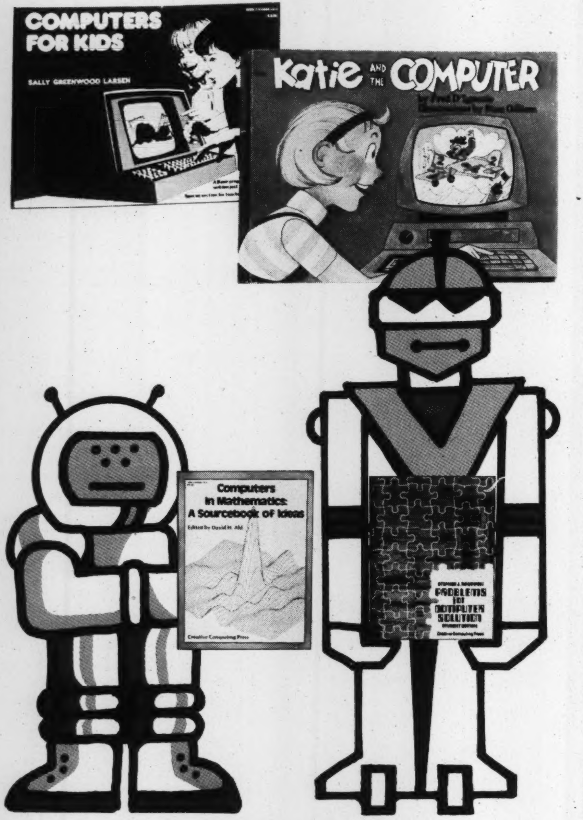

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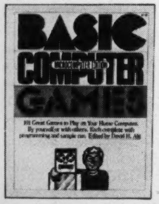

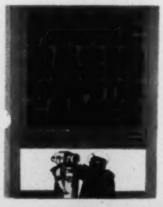

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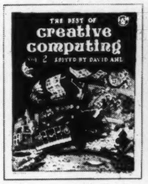

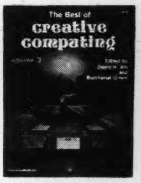

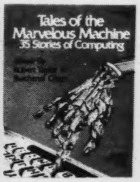

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Dive Bomber

Richard Todd

Dive Bomber is a program written in Applesoft for an Apple II computer with at least 32K of memory. Just type it in and run it; the program has instructions. The following is a brief program description:

Lines 20-160 load the shape tables into memory starting at location 16384 (second hi-res page).

Lines 258-530 draw the game field.

Lines 1000-1240 display scores and misses.

Lines 1300-1330 do a countdown to let the player get ready.

Lines 1340-1700 move the bomb across the screen.

Lines 2000-2070 move the bomb quickly down the screen without checking for rocks.

Lines 2080-3070 move the bomb the rest of the way, checking for rocks.

Lines 4000-4006 check to see if the bomb has hit the ground.

Lines 4015-4100 see what rocks were hit and increments player's score.

Lines 4110-4290 explode rocks.

Lines 4500-4800 make rocks fall.

Line 4810 checks to see if all the rocks have fallen.

Line 5000-5030 check for misses and end the game.

Lines 5040-5060 make the data ready to redraw the board if either the game is started over or an entire set of rocks is cleared.

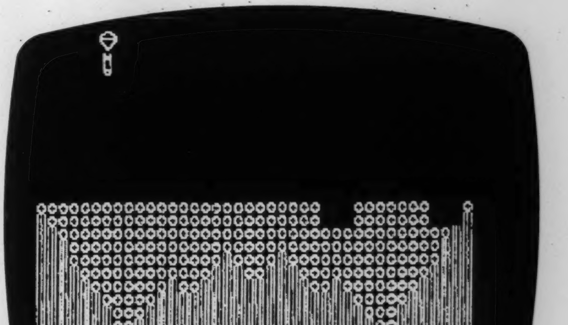
Lines 6000-6200 print the instructions.

Richard Todd, 114 Reynolds House, Box 209, Clarkson College, Potsdam, NY 13676.

On some Apples, the program generates a bogus NEXT WITHOUT FOR ERROR in line 505. This only occurs after the game is finished and the players attempt to play again. The reason seems to be tied in with the way the Apple manages memory and the stack.

If this problem occurs on your system, the fix is to change line 5050 to READ I$: IF I$="END" THEN CALL 54915: GOTO 270. The CALL accesses an Applesoft ROM routine that clears the stack. If anyone has more concrete information concerning strange error messages, please drop us a line—Ed. ☐

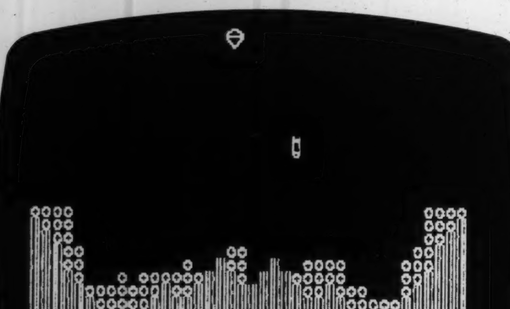
```
  1 HIMEM:8192
  5 DIM B(40,10)
  6 DIM HX(9),HY(9)
 10 HOME
 15 GOSUB 6000
 20 PRINT 'LOADING SHAPE TABLE'
 25 P=16384
 26 POKE 232,0: POKE 233,64
 30 READ I$: IF I$='END' THEN 250
 40 FOR A=1 TO LEN(I$)-1 STEP 2
 50 P$=MID$(I$,A,2)
 60 H=ASC(LEFT$(P$,1))
 70 L=ASC(RIGHT$(P$,1))
 80 H=H-48: IF H>9 THEN H=H-7
 90 L=L-48: IF L>9 THEN L=L-7
100 POKE P,H*16+L
105 P=P+1
110 NEXT A
120 GOTO 30
125 DATA '030008001F003700'
130 DATA '252D2C2D2E35353F3F3F3F37353535352525252525250500'
140 DATA '25253F3F24242C2D253C3E2627372E2D3536363F3F2E2E00'
150 DATA '1225253C3C37372E2E0500'
```



```
PLAYER #1 SCORE:6    MISSES:0    DIVE
PLAYER #2 SCORE:6    MISSES:0    BOMBER
```

Dive Bomber, continued...

```
 160 DATA "END"
 250 S1=0: S2=0: M1=0: M2=0
 255 PRINT "HIT ANY KEY TO BEGIN."
 256 P=PEEK(-16384): IF P<128 GOTO 256
 257 POKE -16368,0
 258 HOME
 260 HGR
 270 ROT=0: SCALE=1
 275 HT=0
 280 FOR X=1 TO 40
 300 READ R: IF R=0 THEN 405
 310 HCOLOR=1
 320 FOR DX=(X-1)*6 TO (X-1)*6+6
 340 HPLOT DX,159 TO DX,159-R*6
 350 NEXT DX
 355 FOR Y=1 TO R: B(X,Y)=5: NEXT Y
 400 HCOLOR=3
 405 FOR Y=R+1 TO 10
 410 DRAW 3 AT (X-1)*6+3,159-(Y-1)*6-3
 415 B(X,Y)=1
 500 NEXT Y
 502 HT=HT+10-R
 505 NEXT X
 520 DATA 9,8,7,5,4,3,2,0,0,1,2,3,4,3,3,4,5,6,5,4
 530 DATA 4,5,6,5,4,3,3,4,3,2,1,0,0,2,3,4,5,7,8,9
1000 HOME
1003 VTAB 22: PRINT TAB(33);: INVERSE: PRINT "DIVE";:
     NORMAL: PRINT ""
1004 VTAB 23: PRINT TAB(32);: INVERSE: PRINT "BOMBER";:
     NORMAL: PRINT ""
1005 SW=-1
1010 IF SW=1 THEN SW=-1: F=230: T=10: GOTO 1030
1020 SW=1: F=10: T=230
1030 IF M1=5 AND SW=1 THEN 1010
1040 IF M2=5 AND SW=-1 THEN 1010
1200 VTAB 22: IF SW=1 THEN INVERSE
1210 PRINT "PLAYER #1";: NORMAL: PRINT TAB(11);"SCORE:
     ";S1;TAB(21);"MISSES:"; M1
1230 VTAB 23: IF SW=-1 THEN INVERSE
1240 PRINT "PLAYER #2";: NORMAL: PRINT TAB(11);"SCORE:
     ";S2;TAB(21);"MISSES:"; M2
1300 FOR CD=5 TO 1 STEP -1
1310 VTAB 21: PRINT "COUNTDOWN:";CD
1315 POKE -16368,0
1320 FOR P=1 TO 300: NEXT P
1330 NEXT CD
1340 VTAB 21: PRINT "
1527 FOR IN=F TO T STEP SW*3
1530 HCOLOR=3: DRAW 1 AT IN-4,10
1535 DRAW 2 AT IN,25
1540 P=PEEK(-16384): IF P>128 THEN POKE -16368,0:
     GOTO 2000
1550 HCOLOR=0
1560 DRAW 1 AT IN-4,10
1570 DRAW 2 AT IN,25
1600 NEXT IN
1700 GOTO 5000
2000 HCOLOR=0: DRAW 1 AT IN-4,10
2002 DRAW 2 AT IN,25
2003 X=IN
2005 FOR Y=25 TO 99 STEP 2
```



```
PLAYER #1 SCORE:76   MISSES:1    DIVE
PLAYER #2 SCORE:81   MISSES:1   BOMBER
```

```
2010 HCOLOR=0: DRAW 2 AT X,Y-2
2020 X=X+SW*1.75
2030 IF X<=0 THEN X=240: GOTO 2050
2040 IF X>=240 THEN X=0
2050 HCOLOR=3: DRAW 2 AT X,Y
2060 NEXT Y
2070 HCOLOR=0: DRAW 2 AT X,99
2080 FOR Y=99 TO 158 STEP 2
3010 HCOLOR=0: DRAW 2 AT X,Y-2
3020 IF B(INT(X/6)+1,INT((159-Y)/6))>0 THEN 4000
3030 X=X+SW*1.75
3040 HCOLOR=3: DRAW 2 AT X,Y
3050 NEXT Y
3060 HCOLOR=0: DRAW 2 AT X,157
3070 GOTO 5000
4000 RX=INT(X/6)+1: RY=INT((159-Y)/6)
4006 IF B(RX,RY)=5 THEN 5000
4010 FOR X=1 TO 9: HX(X)=0: HY(X)=0: NEXT X
4015 HP=1
4020 FOR Y=-1 TO 1: FOR X=-1 TO 1
4025 IF RX+X<1 OR RX+X>40 OR RY+Y<1 OR RY+Y>10 THEN 4100
4030 IF B(RX+X,RY+Y)<>1 THEN 4100
4040 HX(HP)=RX+X: HY(HP)=RY+Y
4050 B(RX+X,RY+Y)=0
4060 IF SW=1 THEN S1=S1+1: GOTO 4070
4065 S2=S2+1
4070 HP=HP+1
4100 NEXT X: NEXT Y
4110 HP=HP-1
4200 FOR FL=1 TO 10
4210 HCOLOR=3
4220 FOR FO=1 TO HP
4230 DRAW 3 AT HX(FO)*6-3,162-HY(FO)*6
4240 NEXT FO
4250 HCOLOR=0
4260 FOR FO=1 TO HP
4270 DRAW 3 AT HX(FO)*6-3,162-HY(FO)*6
4280 NEXT FO
4290 NEXT FL
4500 FS=RX-1: TS=RX+1
4510 IF FS<1 THEN FS=1
4520 IF TS>40 THEN TS=40
4550 FOR S=FS TO TS
4560 FOR Y=2 TO 10
4570 IF B(S,Y)<>1 THEN GOTO 4700
4580 FOR C=Y-1 TO 1 STEP -1
4590 IF B(S,C)<>0 THEN 4615
4600 NEXT C
4610 C=0
4615 IF C+1=Y THEN 4700
4620 B(S,C+1)=B(S,Y): B(S,Y)=0
4630 HCOLOR=0: DRAW 3 AT S*6-3,162-Y*6
4640 HCOLOR=3: DRAW 3 AT S*6-3,162-(C+1)*6
4700 NEXT Y
4800 NEXT S
4810 IF (S1+S2)/HT=INT((S1+S2)/HT) THEN 5040
4900 GOTO 1010
5000 IF SW=1 THEN M1=M1+1
5001 IF SW=-1 THEN M2=M2+1
5005 IF M1+M2<10 THEN 1010
5010 VTAB 21: PRINT "GAME OVER."
5015 S1=0: S2=0: M1=0: M2=0
5020 P=PEEK(-16384): IF P<128 THEN 5020
5030 POKE -16368,0
5040 RESTORE
5050 READ I$: IF I$="END" THEN 270
5060 GOTO 5050
6000 PRINT "DIVE BOMBER -- WRITTEN BY RICHARD TODD"
6005 PRINT: PRINT "INSTRUCTIONS:"
6020 PRINT "YOU AND YOUR OPPONENT ARE BOTH PRIVATES"
6030 PRINT "IN THE U.S. ARMY.  YOUR MISSIONS ARE THE";
6040 PRINT "SAME.  TO CLEAR OUT A MOUNTAIN PASS TO"
6050 PRINT "ALLOW YOUR TROOPS TO GET THROUGH AND"
6060 PRINT "DEFEAT THE ENEMY.  YOU ALTERNATELY DROP"
6070 PRINT "BOMBS IN AN ATTEMPT TO CLEAR OUT AS MANY";
6080 PRINT "ROCKS AS POSSIBLE.  AS YOUR BOMB FLOATS"
6090 PRINT "ACROSS THE SCREEN, HIT ANY KEY TO DROP"
6100 PRINT "IT.  YOU MAY HIT A KEY DURING THE COUNT-";
6110 PRINT "DOWN TO DEPLOY THE BOMB IMMEDIATELY."
6120 PRINT "NOTE:  EACH PLAYER GETS TO MISS 5 TIMES.";
6130 PRINT "YOU MISS IF EITHER YOU FAIL TO DESTROY"
6140 PRINT "ANY ROCKS OR YOU DO DROP YOUR BOMB AT"
6150 PRINT "ALL."
6160 PRINT "ANOTHER NOTE:  THE BOMB 'WRAPS' AROUND"
6170 PRINT "THE SCREEN, TO ALLOW YOU TO HIT ROCKS"
6180 PRINT "THAT WOULD OTHERWISE BE IMPOSSIBLE TO"
6190 PRINT "HIT."
6200 RETURN
```

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7th West Coast Computer Faire

David H. Ahl

Evolution.

Evolution of water creatures into man took millions if not billions of years. The evolution of the wheel into mechanical tools took thousands of years. The evolution of printing hundreds of years. The evolution of solid state electronics tens of years. And personal comptuters? Even less time.

The first hobbyist computer (Altair 8800) was put on the market by MITS in late 1975. Now, seven years later, we find very few new computers being introduced; the evolution has shifted into software.

There is no question that this was the year of software at the 7th West Coast Computer Faire. Yes, there were several new interesting computers and peripherals, in particular, low-cost Winchester disk drives, however, the main emphasis was still on software!

All kinds of software. Pascal language systems. Database management systems. Music synthesis systems. Word processing software. Networking software. And games.

Oh yes, the games. There were hi-res adventure games, shoot 'em up games, arcade ripoffs, simulations of ancient board games, and every imaginable thing in between.

Softalk's award for the best selling software package of 1981 went to Bill Budge for his game of *Raster Blaster*, a simulated pinball game. Two games along the same line, *David's Midnight Magic* from Broderbund and Night Mission Pinball from Sublogic look like potential best sellers in 1982

At *Creative Computing*, we make our award based on the most innovative game of the year. Our award this year went to Chris Crawford for "Eastern Front," an incredibly imaginative and sophisticated simulation of the German/Russian conflict in World War II. This game employs scrolling in eight directions so the user plays a war game on a playing field much larger than could be displayed on the television screen at any one time. It, for the first time, employed artificial intelligence routines to devise enemy moves. It is truly user friendly; all moves are entered with the Atari joystick, a truly amazing feat. We expect it to be one of the best selling games in 1982.

We can not possibly mention all the new products introduced at the Faire. Most of them will be reviewed in upcoming issues of *Creative Computing* and our sister magazine in the business area, *Small Business Computers*. Instead, we present a photo tour of some of the crowded aisles and booths.

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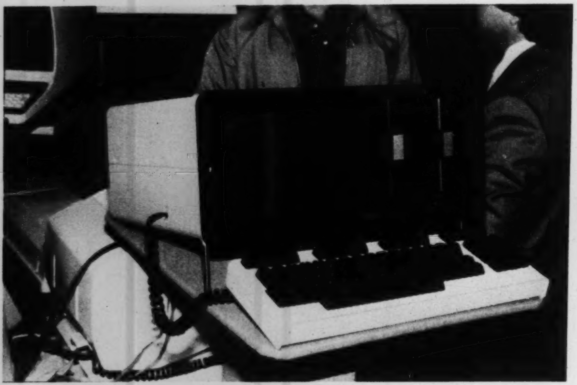
Overhead view of the exhibits in the Civic Auditorium.



Digital Microsystems of Oakland, CA announced a 30/1B portable system called "the Fox." Listing for $3995, the Fox is a CP/M system with two 5" floppy disk drives, 64K memory, a 9" CRT, three serial ports, one parallel port and a high-speed network interface.

YOUNG PEOPLES' LOGO ASSOC
THE YOUNG PEOPLES' LOGO ASSOCIATION, INC.
LOGO
1981

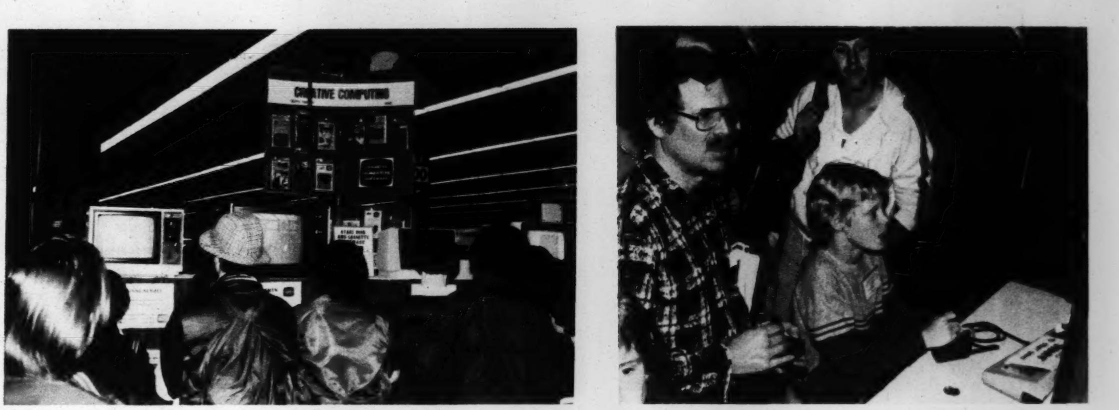
For years, Seymour Papert of MIT was the lone voice extolling the virtues of the LOGO language. Now, with versions available for Apple, Atari and TI computers, the educational community is beating a path to LOGO. Here, Jim Mueller and his son enthusiastically describe it to Faire-goers.

Saul Bernstein shows some of his spectacular Apple graphics being printed on an OmniColor 640. This $4995 high-quality ink jet printer system is a joint venture between PrintaColor Corp. who produce the printer and Quadram Corp. who produce software drivers and hardware interfaces for Apple and IBM computers.

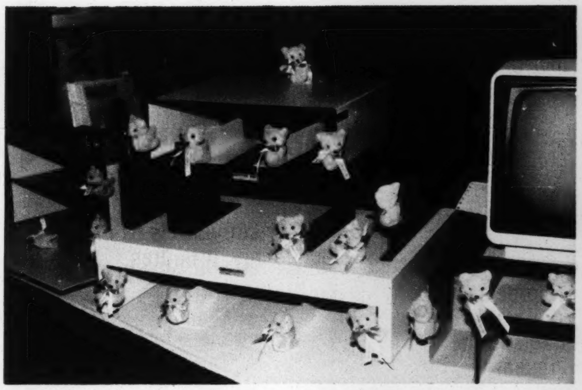
Elcom Systems Peripherals introduced a graphics printer interface for the Apple. Rolling out of the printer were a series of images with outstanding detail.

microPro TM
WordStar

MicroPro attracted considerable attention with WordStar for the IBM Personal Computer along with an easy-to-understand lesson booklet.

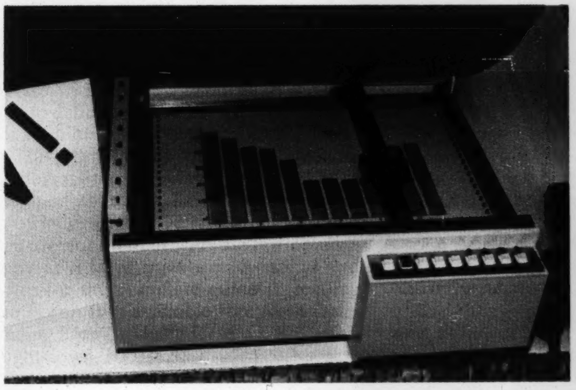


Creative Computing Software introduced a new line of arcade-type games for the Apple and Atari. For three days people lined up five deep to play *Onslaught, Star Clones, Tsunami, Torax, Blisterball*, and *Micro-Golf*.



FMJ, Inc. was showing two new accessory products. Cool Stack for the Apple locks over the computer but can be tilted back for access. Printer Pal holds a printer with a stack of paper beneath.

The CompuPro Division of Godbout Electronics was showing off an extensive line of S-100 bus boards and disk drives in a local networking configuration with spiffy Visual 200 terminals.



Casey-Johnston was showing AutoGraf, a comprehensive CP/M plotting package from Logical Products ($395), driving a 6-color Houston Instruments HiPlot plotter ($1480 to $3275).

ASAP COMPUTER PRODUCTS
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The ASAP Computer Products booth brought back memories of Faires past. They did a booming business with hand-lettered signs, bargain prices and stacks of merchandise.

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Oddsline

Diminishing the Risk of Thoroughbred Wagering Using Your Computer

John Stephenson

We are opposed to gambling. Indeed, on a recent trip to Las Vegas, no one in our group put a single nickel in a slot machine. Nevertheless, if other people insist upon frittering their money away in no-win situations, that's their business.

Clearly, millions of people do like to gamble for one reason or another. Nevada, Atlantic City, Monte Carlo, state lotteries, "charity" bingo, football pools, jai alai, and horse racing are all heavily loaded against the player.

However, by "intelligent" play, one can change the odds dramatically. Card counting in Blackjack, for example, is a proven strategy to shift the odds slightly to the player's advantage. While the author does not make a similar claim for Oddsline, it seems that it might give the user a somewhat better edge than star positions or lucky numbers.

More important from our perspective and the main reason for running this article is that it provides an excellent insight into the analysis of a real-world problem and its solution using a computer simulation. Fortunately, horse racing data are well-quantified and widely available. This, of course, is generally not the case. Nevertheless, the problem-solving steps are well-defined:

1. *Gather data.*
2. *Analyze each type of data and its effect on the outcome.*
3. *Devise a model.*
4. *Try out the model with the data.*
5. *Revise the model and continue to try it with the real-world data until an acceptable fit is found.*

So look at this article with the idea that it illustrates problem-solving and computer simulations. Sure, it might help minimize your losses at the track, but the best way to minimize losses is to not bet at all. —DHA

If you play the thoroughbreds you can get an edge by supplementing your handicapping with the Oddsline analysis.

Oddsline uses the computer to pick the horses with the best chances of winning and to define a minimum fair dollar return for each horse.

This combination identifies real contenders that are good investments. I have assumed that you have a rudimentary knowledge of the Daily Racing Form. If you are not familiar with the Form, buy a copy at a local track or newsstand and write for the complete guide to reading the Form. It is available free from Daily Racing Form, 10 Lake Dr., P.O. Box 1015, Hightstown, NJ 08520.

Program Description

Using statistical weights derived from a large sample of races, the Oddsline works by analyzing the interaction of these fundamentals: recent action, finish last race, overall consistency, speed, and class. The analysis applies to any non-maiden race on the dirt for horses aged three or older. You will find such information in the Form at the head of each race.

The program is written in Applesoft for an Apple computer. It consists of the initialization section beginning at line 1530 and three subsections: user input beginning at line 410, comparison calculations beginning at line 550, and formatted reporting beginning at line 1200.

An ONERR routine at line 1500 is included to handle bad input. The various user assigned ranks for the handicapping components of each horse are held in the two-dimensional array RANK.

The array AD holds the accumulated adjustment factor for each horse and the array RT holds a rating for each horse.

Each race starts with 101 points (SCAL) to be divided among the horses according to their chances of winning. Prior to extracting information from the Racing Form it is assumed that all horses have an equal chance. Consequently, the 101 points are divided equally among them (START), forming the initial rating.

Next, for rank of each horse within each of the components, points are either added to or subtracted from its rating, based on the formulas in lines 1090 to 1130 and the weighted factors (FA) in lines 680 to 1080.

The cumulative amount to be added or subtracted is temporarily stored in the array AD.

The value assigned to variable FA is an expression of how much greater or smaller

---

John Stephenson, 9118 Smith Ave., N. Bergen, NJ 07047.

Oddsline, continued...

the chances of a specifically ranked group of horses are over what would be randomly expected. A value of 1.00 indicates no effect, while a value of less than 1.00 means a smaller chance and a value of more than 1.00 means a greater chance.

The total value of the race is held nearly constant at 101 points so that the final ratings approximate winning percentages, which in turn are converted into common tote board odds.

The strength or weakness of the program rests on how well the weighted factors can predict future winning chances and the presumption that they will remain constant.

The rationale for each component with instructions for supplying input to the program follows.

Recent Action

No horse, even among the greats, runs at anywhere near peak efficiency all the time. Eventually the rigors of racing take their toll and a horse must be given a freshening up.

The rule of thumb explained by Billy Turner, a prominent New York trainer, is that for every month a horse is laid off it requires the same amount of time to return to peak form. The Oddsline asks you for a days-idle rank for each horse. The ranks are listed below:

1. Last race within 10 days.
2. Last race from 11 to 31 days ago.
3. Last race more than 31 days ago.

Rank the horses either 1, 2, or 3. As with any handicapping factor, it pays to know the exceptions. Is there a trainer at your track who has brought back a horse after a long absence only to win at first asking? Did the horse continue to perform well afterward or (more likely) did it deteriorate?

By and large a horse fit to be raced again within 10 days will give most or all of what it can, whereas a horse absent over 31 days is a doubtful proposition.

Finish Last Race

The finish position of a horse in its last race is significant. Those that won or placed in their last race have a better chance to win today. Those that finished second in their last race have a somewhat better chance than those that won their last race, perhaps because they must endure a rise in class less often. However, a horse that won by many lengths seems able to repeat despite a large jump in class.

A third place finish is only a slightly promising sign. A finish in the back-half of the pack (e.g. fifth and sixth or seventh in a seven-horse field—but not fourth) is clearly a negative sign. You must classify horses according to their finish in the last race as shown below:

1. Won.
2. Placed.
3. Showed.
4. Out of money, but in front half of field.
5. Out of money and in rear half of field.

A discouraging performance last time out could have many plausible explanations. The horse may have been outclassed or out of sorts. It may have had a rough trip (i.e. "steadied" or "impeded" or "bothered"). It may have been competing at an unfavorable distance. But, on the whole, horses that raced well last time tend to continue to race well and horses that raced poorly last time tend to continue to race poorly.

Consistency

An honest horse that regularly gets into the money, managed by a trainer who routinely finds races where he can display the capabilities of his horse, is hard to fault. Before this somewhat obvious fact became widely recognized, and hence overbet, a horseplayer who confined his wagers to consistent horses would stay ahead of the game.

Although this is no longer true, a horse that has shown consistency in the past still has an advantage. But beware the sucker horse. He closes rapidly in the stretch race after race, only to fall short by a nose. He seems curiously unable to win. Usually horses with more in the money finishes tend to do better than their less successful rivals.

You must count how many times, as shown in the Daily Racing Form past performances, each horse has run in the money; that is, finished first, second, or third. The program makes comparisons accordingly.

Jockey

Without a sharp horse under him, even the best jockey in the land cannot win. The better a jockey is, the more often trainers will put him up when their horses are in top form. Contracting the services of a talented jockey may not make a winner out of a loser, but may avoid making a loser out of a winner. You are required to divide jockeys into three categories:

1. Among top five at meet as listed in the Daily Racing Form.
2. Has finished close to the winner or in the money on the horse before.
3. Everyone else.

The first group wins often whereas the last group seldom wins.

Speed

The horse that runs fastest wins: thoroughbred racing is as simple as that. Since the winning margin is often less than a fifth of a second, accurate generation of speed ratings and their subsequent interpretation is especially difficult and time-consuming.

For professionals who make their living at the track, continuous diligence in assembling, collating, and refining their speed figures coupled with detailed observation of nine races a day is a way of life.

For us, a more reasonable, although less rewarding, way of handling speed is necessary.

You must rank the horses in order by speed, as listed below:

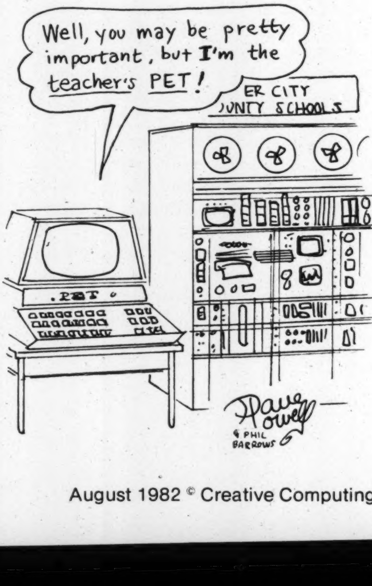
1. Top speed.
2. Second best speed.
3. Third best speed.
4. Not among top three, but in top half of field.
5. Among bottom half of field.

Handicappers have diverse ideas on how exactly to determine the speed figures for a given horse. Using the Daily Racing Form speed figures and adding in the track variant, one simple method is to find the best figure a horse has earned during the last 60 days at today's exact distance.

Should you wish to pursue more exacting methods they can be learned by consulting the literature: I have included a briefly annotated bibliography at the end of this article. The stronger your method of assigning the ranks, the more effective the program will be.

Class

From a dynamic racing point of view, class is the ability of one horse to tap its reserve energy when put to the challenge by another horse. Most horseplayers are familiar with the courage of Forgo, a horse that despite many infirmities had the class to come through when it counted.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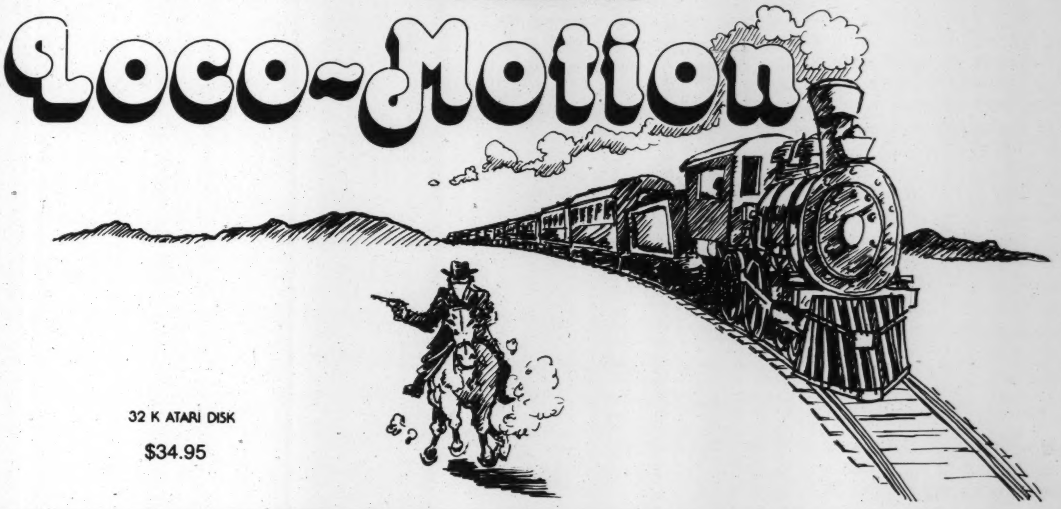

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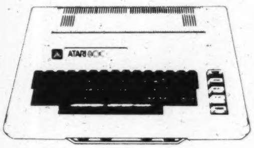

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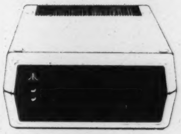

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Oddsline, continued...

From a leaky shed point of view, class is defined as the amount of purse money a horse can earn. Although the total earnings are important, a more encompassing measure is dollar earnings per start. You calculate dollar-per-start figures by dividing the total earnings this year (found in the upper right corner of the past performances for each horse) by his number of starts.

If the horse has started fewer than six times this year, combine this year and last year. After each horse is assigned a class figure, rank them as follows:

1. Highest class figure.
2. Second highest class figure.
3. Third highest class figure.
4. Not among top three, but among top half.
5. All others.

Example

The information in Table 1 was extracted from the Daily Racing Form of November 17, 1980, fourth race at the Meadowlands.

I called the Meadowlands hot-line to be sure there were no late scratches or jockey changes. The information from the Meadowlands was entered into the Oddsline, yielding the report in Table 2.

The number after the name of each horse is the computer estimate of its percentage chance of winning, followed by conversion to the equivalent tote board odds. In the example, the computer thinks that Jerry James has the best chance to win and that Gambling Imp has the worst chance to win.

Using the computer-generated fair odds for each horse, I compared them with the actual tote board odds a few minutes before race time. The idea was to bet a horse likely to win (at least among the upper half of the group) that would pay at least what the computer said it ought to pay. This information should be tempered with any knowledge one has accumulated about individual trainer angles.

Table 1.

I extracted the information tabulated below from the Daily Racing Form of November 17, 1980, fourth race at The Meadowlands.

```
HORSE'S          DAYS   FIN    IN      JOCK    SPEED   CLASS
NAME             IDLE   LAST   $$      RANK    RANK    RANK
                 RANK   RANK   SHOWN
-------------------------------------------------------------

Believe In
Luck              1      3      5       2       4       5
-------------------------------------------------------------
Jerry
James             1      1      6       2       1       3
-------------------------------------------------------------
Gambling
Imp               3      5      2       3       5       5
-------------------------------------------------------------
Cheering
Visitor           2      5      4       3       5       4
-------------------------------------------------------------
Scarlet
Castle            2      5      2       3       5       4
-------------------------------------------------------------
Will Ya
Honey             2      1      3       2       3       1
-------------------------------------------------------------
Fabulous
Leader            1      1      4       2       5       5
-------------------------------------------------------------
Beef
Patties           2      4      4       2       2       4
-------------------------------------------------------------
Walk To
Glory             2      5      2       3       5       5
-------------------------------------------------------------
High
Pressure          2      4      5       2       4       2
-------------------------------------------------------------
Bold
Director          2      3      2       3       3       5

-------------------------------------------------------------
```

Table 2.

```
   11/17/80 MEADOWLANDS
   RACE 4 AT 6 FURLONGS
 *** ODDSLINE REPORT ***

 1) BELIEVE IN LUCK-  12    8-1
 2) JERRY JAMES------ 20    4-1
 3) GAMBLING IMP-----  1  100-1
 4) CHEERING VISITOR   4   26-1
 5) SCARLET CASTLE---  3   34-1
 6) WILL YA HONEY---- 18    9-2
 7) FABULOUS LEADER-  10    9-1
 8) BEEF PATTIES----- 13    7-1
 9) WALK TO GLORY----  2   62-1
10) HIGH PRESSURE---- 13    7-1
11) BOLD DIRECTOR----  7   13-1
```

FOURTH RACE
Meadowlands
NOVEMBER 17, 1980

6 FURLONGS. (1.08⅗) CLAIMING. Purse $7,500. 3-year-olds. Weight, 121 lbs. Non-winners of two races since September 29, allowed 3 lbs. A race since then, 6 lbs. Claiming price $10,000; if for $9,000, 2 lbs. (Races where entered for $8,000 or less not considered.)

Value of race $7,500, value to winner $4,500, second $1,500, third $825, fourth $450, fifth $225. Mutuel pool $77,190. Trifecta Pool $104,171.

Last Raced	Horse	Eqt.	A.Wt	PP	St	¼	½	Str	Fin	Jockey	Cl'g Pr	Odds $1
8Nov80 ^{2}Med^1	Jerry James	b	3 109	2	—	—	—	—	1^3	Bromley T A^7	10000	1.70
8Nov80 ^{2}Med^3	Believe In Luck	b	3 115	1	—	—	—	—	2^3	Colon P	10000	14.00
6Nov80 ^{2}Med^5	Beef Patties	b	3 115	8	—	—	—	—	$3^{1\frac{1}{2}}$	MacBeth D	10000	7.60
6Nov80 ^{2}Med^1	Will Ya Honey		3 116	6	—	—	—	—	$4^{1\frac{1}{2}}$	Ashcroft D C^5	10000	2.90
30Oct80 ^{4}Med^3	Bold Director	b	3 117	11	—	—	—	—	5^{nk}	Sayler B	10000	10.40
31Oct80 ^{9}Aqu^4	High Pressure	b	3 115	10	—	—	—	—	6^2	Miranda J	10000	7.10
6Nov80 ^{2}Med^8	Scarlet Castle	b	3 115	5	—	—	—	—	$7^{\frac{3}{4}}$	Bishop F	10000	10.30
5Nov80 ^{9}Med^7	Cheering Visitor		3 115	4	—	—	—	—	8^{no}	McCauley W H	10000	15.40
6Nov80 ^{2}Med^7	Walk To Glory	b	3 115	9	—	—	—	—	9^{no}	Delguidice R Jr	10000	64.20
11Oct80 ^{9}Key^9	Gambling Imp	b	3 115	3	—	—	—	—	$10^{\frac{3}{4}}$	Nemeti W	10000	84.70
7Nov80 ^{9}Med^1	Fabulous Leader	b	3 115	7	—	—	—	—	11	Nied D	10000	47.90

Running positions omitted because of weather conditions.

OFF AT 9:07, EST. Start unavailable, Won driving. Time, :23⅘, :47⅕, 1:12⅘ Track fast.

$2 Mutuel Prices:			
2–JERRY JAMES	5.40	3.40	3.20
1–BELIEVE IN LUCK		8.60	5.60
8–BEEF PATTIES			4.40

$2 TRIFECTA 2–1–8 PAID $264.80.

B. g, by Big Kohinoor—Pynchum, by But First. Trainer Carlesimo Charles Jr. Bred by Mishoe T N (SC).

Heavy snow obscured the racetrack. JERRY JAMES came into view with a comfortable lead and was not menaced while under steady handling. BELIEVE IN LUCK, closest to the winner, held on for the place. BEEF PATTIES was not a threat as were the others.

Owners— 1, Gilman S; 2, Blue Crest Farms; 3, Monarch Stable; 4, Glory B Stable; 5, B & G Stable; 6, Lou Oliver Stable; 7, Key West Stable; 8, Lib Farm; 9, Hurley Mary; 10, Pierro Geraldine & J; 11, Viera Christine.

Trainers— 1, Carlesimo Charles Jr; 2, Anderson William D; 3, Mullin William; 4, Denoia John A; 5, Gaudet Edmond D; 6, Corbellini William R; 7, Iselin James H; 8, Cunningham Bill W; 9, Hurley Mary; 10, Harvatt Charles R; 11, Viera Christine.

Overweight: Jerry James 1 pound; Bold Director 2.

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Oddsline, continued...

Shortly before race time the tote indicated that Believe In Luck would pay 14-1 and Fabulous Leader would pay 47-1. Both of these horses were among the top half of the field according to the Oddsline analysis. Both would pay a good deal more than the computer estimate of their true chances of winning.

The tote indicated that Jerry James would pay 8-5, much less than the estimate of his true chances. This means that playing horses like Jerry James at 8-5 will, in the long run, lose money, while playing horses like Believe In Luck at 14-1 will, in the long run, yield a profit.

Fabulous Leader, at 47-1, seemed a super value, but experience had shown me that when a horse convincingly breaks his maiden in his last race, as Fabulous Leader did, and subsequently gets little support, he is merely out for exercise. My play was Believe In Luck to win, place, and show.

The snow fell heavily that night obscuring the racetrack. Jerry James was first to emerge into the stretch with a comfortable lead, winning easily. Too bad, but not surprising. Believe In Luck was next under the wire, no profit on the win-place-show wager. Beef Patties was a sluggish third, while Fabulous Leader finished last.

Things do not work out so predictably every time (otherwise I would be a rich man). Nevertheless, the Oddsline has given me many hours of fun. I hope it does the same for you. ☐

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```
0  REM          ODDSLINE
10  SPEED= 255: PRINT
20  NOTRACE : TEXT : HOME
30  GOTO 1530
40  REM  *** CENTER ***
50 HT% = (40 -  LEN (T$)) / 2 + 1
60  HTAB HT%: PRINT T$: NORMAL : RETURN
70  REM  *** HORSE'S NAME ***
80  VTAB V%: INPUT "          HORSE'S NAME:";H$(I)
90  IF  LEN (H$(I)) < 1 THEN  CALL 64477: GOTO 80
100  IF  LEN (H$(I)) > L1% THEN H$(I) =  LEFT$ (H$(I),L1%)
110  RETURN
120  REM  *** DAYS IDLE ***
130  VTAB V%: INPUT "DAYS IDLE RANK(1-3):";RANK(I,1)
140  IF RANK(I,1) > 3 OR RANK(I,1) < 1 THEN  CALL 64477:GOTO
     130
150  RETURN
160  REM   *** FORM ***
170  VTAB V%: INPUT "FIN LAST RANK (1-5):";RANK(I,2)
180  IF RANK(I,2) > 5 OR RANK(I,2) < 1 THEN  CALL 64477:GOTO
     170
190  RETURN
200  REM  *** CONSISTENCY ***
210  VTAB V%: INPUT " NO. OF IN-$$ SHOWN:";RANK(I,3)
220  IF RANK(I;3) < 0 OR RANK(I,3) > 10 THEN 210
230  RETURN
240  REM  *** JOCKEY ***
250  VTAB V%: INPUT "  JOCKEY RANK (1-3):";RANK(I,4)
260  IF RANK(I,4) < 1 OR RANK(I,4) > 3 THEN  CALL 64477:GOTO
     250
270  RETURN
280  REM  *** SPEED ***
290  VTAB V%: INPUT "   SPEED RANK (1-5):";RANK(I,5)
300  IF RANK(I,5) < 1 OR RANK(I,5) > 5 THEN 290
310  RETURN
320  REM  *** CLASS ***
330  VTAB V%: INPUT "   CLASS-RANK (1-5):";RANK(I,6)
340  IF RANK(I,6) < 1 OR RANK(I,6) > 5 THEN  CALL 64477:GOTO
     330
350  RETURN
360  REM  *** CORRECT? ***
370  VTAB 23:T$ = C$: GOSUB 40: GOSUB 490
380  IF KEY% =  ASC ("Y") THEN OK% = 1: RETURN
390  IF KEY% =  ASC ("N") THEN OK% = 0: RETURN
400  GOSUB 520: GOTO 370
410  REM  *** H O R S E   I N F O ***
420 I = 1
430  PRINT  CHR$ (12): HOME :T$ =
     "*** HORSE INFORMATION ***":
      VTAB 1: GOSUB 40: PRINT : PRINT "
      ...FOR POST POS #";I: PRINT
440 V% = 6: GOSUB 70:V% = V% + 2: GOSUB 120:V% =
    V% + 2: GOSUB 160:V% = V% + 2: GOSUB 200:V% = V% + 2:
    GOSUB 240:V% = V% + 2
    : GOSUB 280:V% = V% + 2: GOSUB 320: GOSUB 360
450  IF  NOT OK% THEN 430
460 I = I + 1
470  IF I > SIZE THEN  RETURN
480  GOTO 430
490  REM  *** KEYIN ***
```

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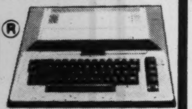

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Oddsline, continued...

```
500  WAIT  - 16384,128: POKE  - 16368,0:KEYZ =
     PEEK ( - 16384 ): IF KEYZ > 127 THEN KEYZ = KEYZ - 128
510  RETURN
520  REM  *** RASPBERRY ***
530  FOR Z1 = 1 TO 6:Z3 =  PEEK (ZZ)
     PEEK (ZZ) :  PEEK (ZZ)
      -  PEEK (ZZ) :  PEEK (ZZ): FOR Z2 = 1 TO 48: NEXT :
     NEXT : FOR Z1 = 1 TO 127: NEXT Z1
540  RETURN
550  REM  *** CALCULATIONS ***
560  PRINT  CHR$ (12): HOME :T$ = "CALCULTING - PLEASE WAIT":
VTAB 12: FLASH : GOSUB 40
570 START = SCAL / SIZE
580  FOR J = 1 TO SIZE:AD(J) = 0:RT(J) = START: NEXT J
590  FOR J = 1 TO SIZE:H = J
600  GOSUB 680: GOSUB 730: GOSUB 800: GOSUB 900:
     GOSUB 950: GO SUB 1020
610  NEXT
620  FOR J = 1 TO SIZE
630 RT(J) = RT(J) + AD(J)
640  IF RT(J) < 1 THEN RT(J) = 1
650  IF RT(J) > (SCAL - 1) THEN RT(J) = SCAL - 1
660  NEXT
670  RETURN
680  REM  DI
690  IF RANK(H,1) = 1 THEN FA = 1.15
700  IF RANK(H,1) = 2 THEN FA = 0.99
710  IF RANK(H,1) = 3 THEN FA = 0.76
720 IV = FA:HH = H: GOTO 1140
730  REM  FL
740  IF RANK(H,2) = 1 THEN FA = 1.52
750  IF RANK(H,2) = 2 THEN FA = 1.58
760  IF RANK(H,2) = 3 THEN FA = 1.17
770  IF RANK(H,2) = 4 THEN FA = 0.92
780  IF RANK(H,2) = 5 THEN FA = 0.69
790 IV = FA:HH = H: GOTO 1140
800  REM  MY
810  IF RANK(H,3) = 0 THEN FA = 0.34
820  IF RANK(H,3) = 1 THEN FA = 0.66
830  IF RANK(H,3) = 2 THEN FA = 0.83
840  IF RANK(H,3) = 3 THEN FA = 0.83
850  IF RANK(H,3) = 4 THEN FA = 1.00
860  IF RANK(H,3) = 5 THEN FA = 1.36
870  IF RANK(H,3) = 6 THEN FA = 1.36
880  IF RANK(H,3) > 6 THEN FA = 1.64
890 IV = FA:HH = H: GOTO 1140
900  REM  JR
910  IF RANK(H,4) = 1 THEN FA = 1.46
920  IF RANK(H,4) = 2 THEN FA = 1.17
930  IF RANK(H,4) = 3 THEN FA = 0.60
940 IV = FA:HH = H: GOTO 1140
950  REM  SR
960  IF RANK(H,5) = 1 THEN FA = 1.65
970  IF RANK(H,5) = 2 THEN FA = 1.54
980  IF RANK(H,5) = 3 THEN FA = 1.25
990  IF RANK(H,5) = 4 THEN FA = 0.84
1000  IF RANK(H,5) = 5 THEN FA = 0.61
1010 IV = FA:HH = H: GOTO 1140
1020  REM  CL
1030  IF RANK(H,6) = 1 THEN FA = 1.82
1040  IF RANK(H,6) = 2 THEN FA = 1.36
1050  IF RANK(H,6) = 3 THEN FA = 1.22
1060  IF RANK(H,6) = 4 THEN FA = 0.95
1070  IF RANK(H,6) = 5 THEN FA = 0.69
1080 IV = FA:HH = H: GOTO 1140
1090  REM  ADDTO
1100 AD = ((IV * START) - START) / 2
1110  REM  SUBFROM
1120 SF = AD / (SIZE - 1)
1130  RETURN
1140  REM   ADJUST
1150  GOSUB 1090: FOR LOOP = 1 TO SIZE
1160  IF LOOP = HH THEN AD(LOOP) = AD(LOOP) + AD
1170  IF LOOP >  < HH THEN AD(LOOP) = AD(LOOP) - SF
1180  NEXT LOOP
1190  RETURN
1200  REM  *** REPORT ***
1210  TEXT : HOME :T$ = DT$ + " " + TR$:
      GOSUB 40:T$ = "RACE "
       + RC$ + " AT " + DS$: GOSUB 40:T$ =
      "*** ODDSLINE REPORT ***
      ": GOSUB 40: PRINT
1220 TTL = SCAL
```

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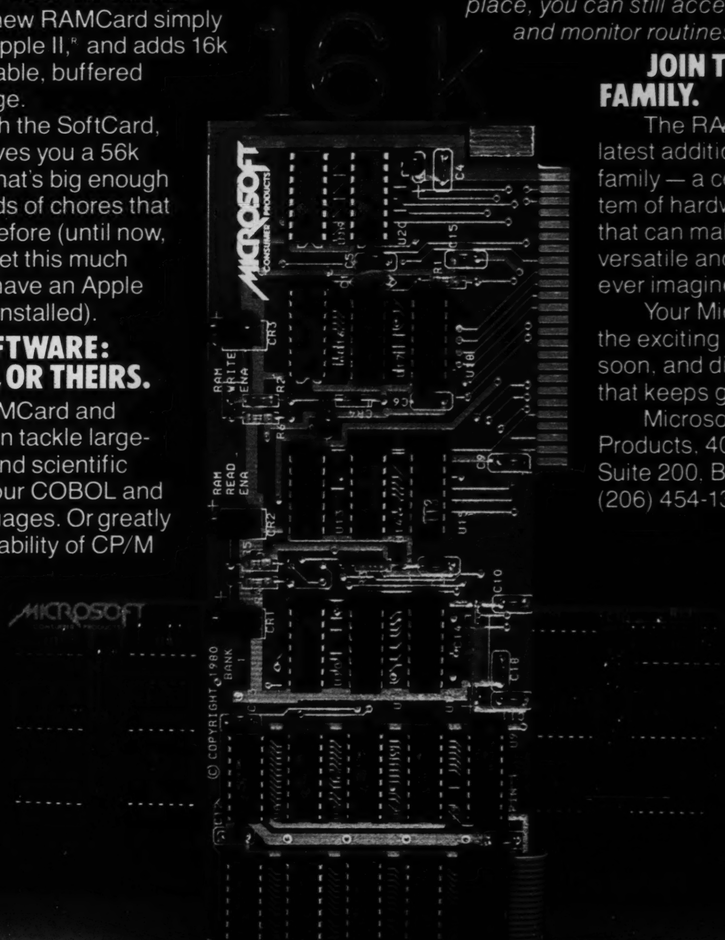

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Oddsline, continued...

```
1230  FOR J = 1 TO SIZE
1240  IF J < 10 THEN  PRINT " ";
1250  PRINT J;") ";
1260  PRINT H$(J);
1270 I = L1% + 1 -  LEN (H$(J)):
     FOR K = 1 TO I: PRINT " ";: NEXT
1280 AB =  INT (RT(J) + .5)
1290 AB$ =  STR$ (AB):I = 1 +  LEN ( STR$ (SCAL))
     LEN (AB$)
     : FOR K = 1 TO I: PRINT " ";: NEXT : PRINT AB;" ";
1300 OD = TTL / RT(J) - 1
1310 OD =  INT (OD * 10 + .5) / 10
1320  GOSUB 1370
1330 I = 6 -  LEN (OD$)
1340  FOR K = 1 TO I: PRINT " ";: NEXT : PRINT OD$
1350  NEXT J
1360  RETURN
1370  REM   CONVERT TO COMMON TOTE ODDS
1380 FIG = 10 * OD
1390  IF  NOT FIG THEN OD = .1: GOTO 1380
1400  IF FIG >  = 50 THEN OD$ =
      STR$ ( INT (OD + .5)) + "-1": RETURN
1410  IF FIG < 19 THEN 1460
1420 MT =  INT ((FIG / 10 -
     INT (FIG / 10)) * 10 + .05) *  SGN (FIG / 10)
1430  IF MT >  = 3 AND MT <
      = 7 THEN OD$ =  STR$ ( INT (OD) * 2 + 1) + "-2": RETURN
1440  IF MT > 7 THEN OD = OD + 1
1450 OD$ =  STR$ ( INT (OD)) + "-1": RETURN
1460 MT =  INT ((FIG / 2 -
     INT (FIG / 2)) * 2 + .05) *  SGN (FIG / 2)
1470  IF MT THEN FIG = FIG + 1
1480  IF FIG = 10 THEN OD$ = "EVEN": RETURN
1490 OD$ =  STR$ (FIG * 5 / 10) + "-5": RETURN
1500 ER =  PEEK (222):EL =  PEEK (218) + 256 *  PEEK (219)
1510  IF ER = 254 THEN  VTAB  PEEK (37): GOSUB 520: RESUME
1520  PRINT "ERROR CODE: ";ER;"  AT LINE ";EL: STOP : END
1530  REM  *** M A I N ***
1540 SCAL = 101
1550  DIM RT(12),RANK(12,6),H$(12),AD(12)
1560 C$ = "CORRECT -Y/N"
1570 L1% = 15:ZZ =  - 16336
1580  ONERR  GOTO 1500
1590  TEXT : HOME :T$ =
      "*** ODDSLINE PROGRAM ***": GOSUB 40: PRINT
1600  INPUT "                   TRACK:";TR$
1610  INPUT "                    DATE:";DT$
1620  INPUT "                    RACE:";RC$
1630  INPUT "                DISTANCE:";DS$
1640  INPUT "               SIZEFIELD:";SIZE
1650  IF SIZE < 2 OR SIZE >
      12 THEN  PRINT : PRINT "SIZE MUST
      BE BETWEEN 2 AND 12": PRINT : GOTO 1640
1660  GOSUB 410
1670  GOSUB 550
1680  GOSUB 1200
1690  VTAB 23:C$ = "ANOTHER LINE -Y/N": GOSUB 360
1700  IF OK% THEN  RUN
1710  VTAB 22: NEW : END
65535  REM


******************************
*                            *
*   ODDSLINE                 *
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*                            *
******************************
```

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Low-Res Graphics For Time Traveler

Anthony J. Chiaramida

Color graphics are an attractive addition to any program. While *Creative Computing* has presented many articles on modifying your own programs, this article will show you how to add a color routine to a commercial software package, *Time Traveler* by Krell.

Adventure games, by definition, rely on imagination and logic. The screen frequently shows only statements of text, and pictures are imaginary. However, in several currently available programs this can be changed, as I will describe below.

In general, the process for adding a color routine is as follows. Begin with a language you use often. Next, select a program written in that language. Begin by loosely diagramming the flow of the program in printing out to the screen. Every time the program prints to the screen, you have an opportunity to branch to a personalized color routine.

After deciding where you would like to have an elaborate output, you will need to locate the line numbers of the statements controlling this output in the original program. The trace command simplifies this for Apple users. If you have a printer of course, a listing makes it even easier.

For example, imagine the following hypothetical program, we'll call "Submarine Alert."

You would be in control of a submarine and its offensive and defensive armaments. Imagine a flow of the program as below.

(1) List of Current Capabilities

⇩

(2) Input Option (move, screen attack, defend, etc.)

⇩

(3) List Results

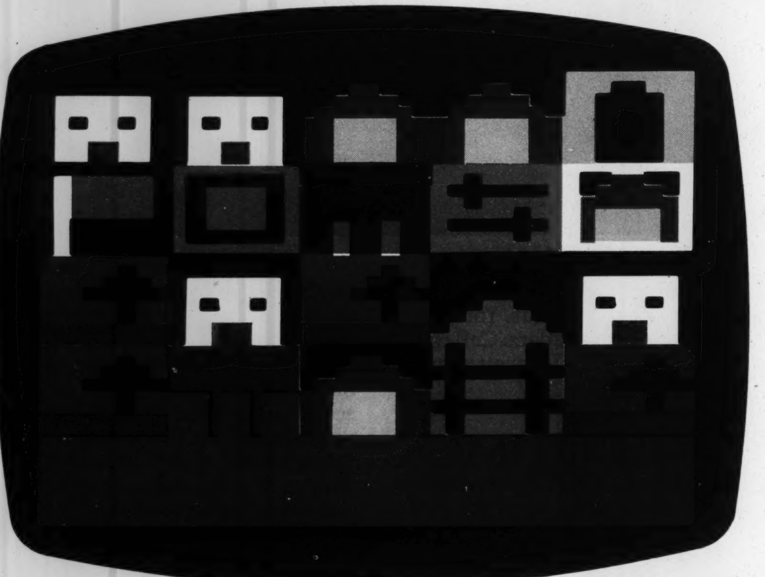
⇩

(4) List Current Capabilities (e.g. mobility, fuel, missiles, torpedoes, etc.)

⇩

(5) Repeat

At each stage of this program, it would be possible to branch to a color subroutine.



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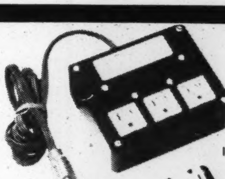

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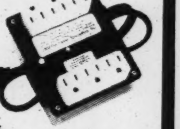

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Figure 1.

```
P T A Q B
F H H H F
F F S M M
C D H M M
W W W W W
```

Text (letters)

P	T	A	Q	B
F	H	H	H	F
F	F	S	M	M
C	D	H	M	M
W	W	W	W	W

Graphics (letters used to represent pictures)

At stage one, imagine the screen looked like this:

```
FUEL              200 GALLONS
ENGINE STATUS     MAX: 3/4 THROTTLE
TORPEDO NUMBER    4 LEFT
MISSILE NUMBER    2 LEFT
```

These lines would have been printed out in a PRINT statement, which could be found by LISTing the entire program, or by using the TRACE mode. You would have to substitute a GOTO or GOSUB with your color routine as the endpoint. The color routine above could consist of a picture of a ship with pictures of fuel, engines, torpedoes, and missiles. The amount of fuel could be represented by a partially filled tank.

First, you would design a subroutine to draw the ship, then a fuel tank. The picture of the fuel in the tank would be a function of the variable which represented gallons in the original program. The rest of the picture, the missiles, for example, would be a function of that variable in the original program. After drawing the entire picture, you would program a simple return to TEXT for continuation of the program. This is done with the following line:

```
Z $ = "  " : GET Z $ : TEXT :
RETURN
```

When any key is pressed, the program switches to the text mode, and will continue execution. Since you have only changed *output*, you will not affect the way your program works.

A practical example is the one that will be presented here. The routines listed are specific for *Time Traveler*, though a similar system would work for *Monster Combat*, for example. The method applies to most programs in which a map is printed in text during the simulation.

In *Time Traveler*, a player has the option of obtaining a map of his environment. The map (drawn from the software as provided) is drawn with letters on a field of text. To transpose this routine to color graphics is relatively simple. The hard work has already been done by Krell.

Each of twelve possible locations (arsenal, dock, house, field, cave, barracks, headquarters, square, water, treasury, market, and prison) is represented by a letter in a matrix YM$ (PD).

In the original program, each letter is printed on a grid with a PRINT routine; the map is printed on a grid of 5 x 5 locations. Since the screen for lo-res graphics on the Apple is 40 x 40, the screen can hold 25 pictures (each 8 x 8) in a 5 x 5 grid. (See Figure 1.)

The generation of the letters is used as the key to generation of the graph. Once the matrix is filled, the new routine (which draws a picture) is entered.

We must do three things: make color graphs (8 x 8) for each of twelve possible cells; change the print routine to a graph routine; change the spacing mode, so that the pictures are correctly placed.

The first part—drawing the pictures—is the most enjoyable. Take any of the sixteen Apple colors and fill an 8 x 8 graph with a pattern to represent one of the locations on the map. The upper left hand location for all pictures is x,y.

You can be as simple or as sophisticated as you like. Remember, the results need please only you.

The second part—changing the PRINT routines to a Graphics routine—is done in line 575. At this line, the program changes to graphics mode, adjusts the coordinates for the picture to be printed, then branches to the picture routine.

From line 589 to line 600, the program checks the letter of the location, and draws the appropriate picture, returning when finished for the next letter.

To indicate your present location, a white rectangle is drawn around the box which corresponds with your present location. To use my version of the color graphics you will need to do the following:

- Delete lines 575 to 601.
- Add the following listing of lines 575 to 601.
- Add the following routines (or substitute your own) in lines 10000 to 11200.

You may also want to add the following

```
575  GR : FOR IJ = 0 TO 4: FOR IX
      = 0 TO 4: GOSUB 5053:Y = IJ
      * 8:X = IX * 8: GOSUB 589: GOSUB
     587: NEXT : NEXT
578  PRINT : PRINT "CONTINUE ?"
582 Z$ = "": GET Z$: TEXT : HOME
     : GOTO 114
587  IF M1 = IX AND M2 = IJ THEN
      GOSUB 11200: RETURN
588  REM  LETTER TO PICTURE
589  IF YM$(PD) = "D" THEN  GOSUB
     10000
590  IF YM$(PD) = "A" THEN  GOSUB
     10100
591  IF YM$(PD) = "H" THEN  GOSUB
     10200
592  IF YM$(PD) = "F" THEN  GOSUB
     10300:
593  IF YM$(PD) = "C" THEN  GOSUB
     10400
594  IF YM$(PD) = "S" THEN  GOSUB
     10700
595  IF YM$(PD) = "M" THEN  GOSUB
     11000
596  IF YM$(PD) = "T" THEN  GOSUB
     10900
597  IF YM$(PD) = "B" THEN  GOSUB
     10500
598  IF YM$(PD) = "Q" THEN  GOSUB
     10600
599  IF YM$(PD) = "W" THEN  GOSUB
     10800
600  IF YM$(PD) = "P" THEN  GOSUB
     11100
601  RETURN
10000  REM   COLOR SUBROUTINES
10001  COLOR= 2: FOR Z = Y TO (Y +
     7): HLIN X,X + 7 AT Z: NEXT

10002  COLOR= 8: FOR Z = Y TO (Y +
     3): HLIN X,X + 7 AT Z: NEXT
     Z:
10003  COLOR= 8: VLIN Y + 2,Y + 7
      AT X + 3: VLIN Y + 2,Y + 7 AT
     X + 5
10008  RETURN
10100  COLOR= 9: FOR Z = Y TO (Y +
     7): HLIN X,X + 7 AT Z: NEXT

10102  COLOR= 0: HLIN X + 1,X + 6
      AT Y + 2: HLIN X + 1,X + 6 AT
     Y + 5: VLIN Y + 1,Y + 3 AT X
      + 2: VLIN Y + 4,Y + 6 AT X +
     5: RETURN
10200  COLOR= 11: FOR Z = (Y + 2)
      TO (Y + 7): HLIN X + 1,X +
     6 AT Z: NEXT :
10220  COLOR= 15: PLOT X + 2,Y +
     3: PLOT X + 5,Y + 3: COLOR=
     0: PLOT X + 2,Y + 4: PLOT X +
     5,Y + 4: COLOR= 8: HLIN X +
     3,X + 4 AT Y + 6: HLIN X + 3
     ,X + 4 AT Y + 7: RETURN
10300  COLOR= 2: FOR Z = Y TO (Y +
     5): HLIN X,X + 7 AT Z: NEXT
10302  COLOR= 8: HLIN X,X + 7 AT
     Y + 6: HLIN X,X + 7 AT Y + 7
     :
10304  COLOR= 12: PLOT X + 3,Y +
     3: PLOT X + 7,Y + 3: VLIN Y +
     2,Y + 3 AT X + 4: VLIN Y + 2
     ,Y + 3 AT X + 6: VLIN Y + 1,
     Y + 3 AT X + 5: COLOR= 5: VLIN
     Y + 4,Y + 5 AT X + 5: RETURN

10400  COLOR= 5: FOR Z = Y TO (Y +
     7): HLIN X,X + 7 AT Z: NEXT

10402  COLOR= 0: VLIN Y + 2,Y + 7
      AT X + 2: VLIN Y + 2,Y + 7 AT
     X + 5: VLIN Y + 1,Y + 7 AT X
      + 3: VLIN Y + 1,Y + 7 AT X +
     4: RETURN
10500  COLOR= 4: FOR Z = Y + 3 TO
     (Y + 7): HLIN X,X + 7 AT Z: NEXT

10501  PLOT X,Y + 2: PLOT X + 3,Y
      + 2: PLOT X + 4,Y + 2: PLOT
     X + 7,Y + 2: PLOT X + 1,Y +
     2: PLOT X + 6,Y + 2
10502  COLOR= 1: VLIN Y + 5,Y + 7
      AT X + 2: VLIN Y + 5,Y + 7 AT
     X + 5: RETURN
10600  COLOR= 15: VLIN Y + 1,Y +
     7 AT X + 1: COLOR= 3: FOR Z =
     (Y + 1) TO (Y + 4): HLIN X +
     2,X + 6 AT Z: NEXT : RETURN

10700  COLOR= 4: FOR Z = X TO (X +
     7): VLIN Y,Y + 7 AT Z: NEXT
     : COLOR= 0: HLIN X + 1,X + 6
      AT Y + 1: HLIN X + 1,X + 6 AT
     Y + 6: VLIN Y + 1,Y + 6 AT X
      + 1
10702  VLIN Y + 1,Y + 6 AT X + 6:
      RETURN
10800  COLOR= 2: FOR Z = Y TO (Y +
     7): HLIN X,X + 7 AT Z: NEXT
     : RETURN
10900  COLOR= 13: HLIN X + 3,X +
     4 AT Y + 4: HLIN X + 2,X + 5
      AT Y + 5: HLIN X + 1,X + 6 AT
     Y + 6: HLIN X,X + 7 AT Y + 7
     : RETURN
11000  COLOR= 8: HLIN X + 3,X + 4
      AT Y + 1: HLIN X + 2,X + 5 AT
     Y + 2: HLIN X + 1,X + 6 AT Y
      + 3: FOR Z = (Y + 4) TO (Y +
     7): HLIN X,X + 7 AT Z: NEXT

11002  COLOR= 5: FOR Z = (Y + 4) TO
     (Y + 7): HLIN (X + 2),(X + 5
     ) AT Z: NEXT : RETURN
11100  COLOR= 1: FOR Z = Y TO (Y +
     7): HLIN X,X + 7 AT Z: NEXT
     : COLOR= 0: HLIN X,X + 7 AT
     Y + 2: HLIN X,X + 7 AT Y + 5
     : VLIN Y,Y + 7 AT X + 1: VLIN
     Y,Y + 7 AT X + 6:
11102  RETURN
11200  COLOR= 15: HLIN X,X + 7 AT
     Y: HLIN X,X + 7 AT Y + 7: VLIN
     Y,Y + 7 AT X: VLIN Y,Y + 7 AT
     X + 7: RETURN
```

change to line 602: Add HOME to the beginning of line 602. This prevents the text from scrolling while you are trying to read it.

I believe you will enjoy this new version of *Time Traveler*. If you review your own inventory of programs, you will probably find some that lend themselves to the addition of graphics.

You can consider the following possibilities for *Time Traveler* alone: during combat you could print a graphics representation of both your forces and the enemy forces; when using the ring—locate feature—have a map printed out in graphics; when using the search feature, have all signs drawn in graphics. The possibilities are many and varied. □

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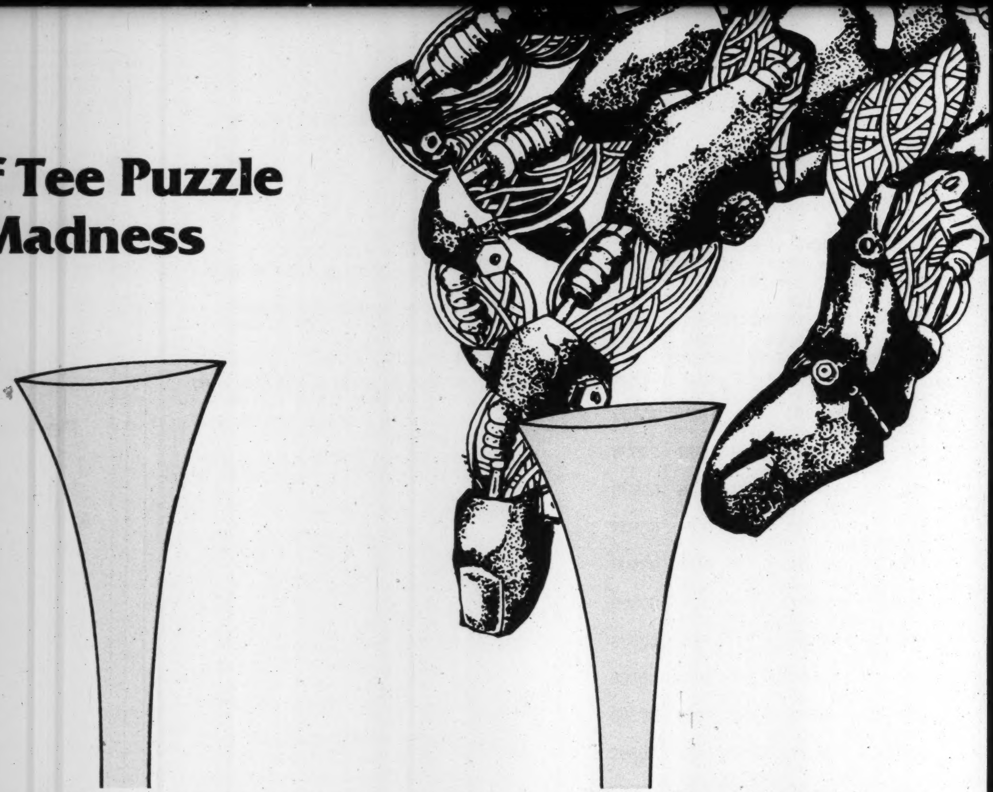
Golf Tee Puzzle Madness



David A. Bennett

I was visiting relatives during a holiday, and had just finished a sumptuous feast when it began. My father-in-law handed me a small triangular piece of wood with 15 regularly spaced holes and 14 pegs resembling golf tees, and said, "You have a logical mind; see if you can jump the pegs over each other until only one peg remains."

Of course, having a logical mind, I couldn't resist this sinister trap and proceeded to spend the better part of a Saturday afternoon mumbling to myself and fending off invitations from my family to break away from the puzzle's deadly spell.

After this initiation I came to two realizations: I had spent a great deal of time and had actually found a solution to the puzzle; and a computer could have spent less time and found many solutions to the puzzle. This article presents the results of my resolve to teach a computer to manipulate those infuriating pegs.

This game is representative of a broad class of games which can be mastered by a computer through the construction of a tree of moves and counter-moves. Most such games are either too simple to be of interest to human players, or too complex to be solved completely through construction of a tree. Therefore, this game finds a happy medium where one can bounce back and forth between studying a mechanical solution and studying a human solution, and not be bored or confused by either.

David Bennet, 76 Prospect Hill Ave., Summit, NJ 07901.

The program and accompanying notes presented in this article will thus satisfy three goals:

- It illustrates a computer generated answer to a rather complex question. The machine demonstrates "artificial intelligence" in the sense that it finds puzzle solutions which people are not "smart" enough to find themselves. The irony of such artificial intelligence is that it works not through brilliant insight, but through the tedious application of well-specified, but simple logic.
- It teaches about the representation of board game strategy. Many other games may be programmed using the same building blocks of tree generation, pruning rules, move generators, board evaluators, and so forth. (Of course, other game implementations will require entirely different versions of these modules. However, the concepts are similar and the basic structure may remain the same.)
- It illustrates some fascinating programming concepts, such as recursion and graphic animation.

After reading this, you will have been exposed to some fundamental computer game simulation concepts. These will give you insight into how others have programmed games and provide the tools to create your own simulations.

The remainder of the article contains a brief historical perspective on games and computers, a synopsis of the puzzle, a detailed presentation of the way the program plays the game, and finally some enlightening conclusions.

Artificial Intelligence,
Checkers, and Cannibals

"Artificial Intelligence" (AI) means many things to many people. M. L. Minsky, one of the leaders in the field, has said that "artificial intelligence is the science of making machines do things that would require intelligence if done by men."

This is a very broad definition, and certainly in the early days of AI research the programming of machines to play games such as chess and checkers was considered mainstream stuff.

One of the first and most successful AI projects was a program by Samuels to play checkers. It had the ability to remember all games it had played and learn from its mistakes.

It played by examining possible future moves and evaluating each board position derived. The quality of each position was a function of the rules concerning piece deployment and the quality of boards reachable from the current board.

As it accumulated a history of play, the relative weights of future boards dominated its evaluation. The program quickly surpassed its author in skill, and moved on

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9	DEPRDB	Declining balance depreciation
10	DEPRDDB	Double declining balance depreciation
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13	CHECKBK1	Checkbook maintenance program
14	MORTGAGE/A	Mortgage amortization table
15	MULTMON	Computes time needed for money to double, triple, etc.
16	SALVAGE	Determines salvage value of an investment
17	RRVARIN	Rate of return on investment with variable inflows
18	RRCONST	Rate of return on investment with constant inflows
19	EFFECT	Effective interest rate of a loan
20	FVAL	Future value of an investment (compound interest)
21	PVAL	Present value of a future amount
22	LOANPAY	Amount of payment on a loan
23	REGWITH	Equal withdrawals from investment to leave 0 over
24	SIMPDISK	Simple discount analysis
25	DATEVAL	Equivalent & nonequivalent dated values for oblig.
26	ANNUDEF	Present value of deferred annuities
27	MARKUP	% Markup analysis for items
28	SINKFUND	Sinking fund amortization program
29	BONDVAL	Value of a bond
30	DEPLETE	Depletion analysis
31	BLACKSH	Black Scholes options analysis
32	STOCVAL1	Expected return on stock via discounts dividends
33	WARVAL	Value of a warrant
34	BONDVAL2	Value of a bond
35	EPSEST	Estimate of future earnings per share for company
36	BETAALPH	Computes alpha and beta variables for stock
37	SHARPE1	Portfolio selection model-i.e. what stocks to hold
38	OPTWRITE	Option writing computations
39	RTVAL	Value of a right
40	EXPVAL	Expected value analysis
41	BAYES	Bayesian decisions
42	VALPRINF	Value of perfect information
43	VALADINF	Value of additional information
44	UTILITY	Derives utility function
45	SIMPLEX	Linear programming solution by simplex method
46	TRANS	Transportation method for linear programming
47	EOQ	Economic order quantity inventory model
48	QUEUE1	Single server queueing (waiting line) model
49	CVP	Cost-volume-profit analysis
50	CONDPROF	Conditional profit tables
51	OPTLOSS	Opportunity loss tables
52	FQUOQ	Fixed quantity economic order quantity model

	NAME	DESCRIPTION
53	FQEOWSH	As above but with shortages permitted
54	FQEOQPB	As above but with quantity price breaks
55	QUEUECB	Cost-benefit waiting line analysis
56	NCFANAL	Net cash-flow analysis for simple investment
57	PROFIND	Profitability index of a project
58	CAP1	Cap. Asset Pr. Model analysis of project
59	WACC	Weighted average cost of capital
60	COMPBAL	True rate on loan with compensating bal. required
61	DISCBAL	True rate on discounted loan
62	MERGANAL	Merger analysis computations
63	FINRAT	Financial ratios for a firm
64	NPV	Net present value of project
65	PRINDLAS	Laspeyres price index
66	PRINDPA	Paasche price index
67	SEASIND	Constructs seasonal quantity indices for company
68	TIMETR	Time series analysis linear trend
69	TIMEMOV	Time series analysis moving average trend
70	FUPRINF	Future price estimation with inflation
71	MAILPAC	Mailing list system
72	LETWRT	Letter writing system-links with MAILPAC
73	SORT3	Sorts list of names
74	LABEL1	Shipping label maker
75	LABEL2	Name label maker
76	BUSBUD	DOME business bookkeeping system
77	TIMECLCK	Computes weeks total hours from timeclock info.
78	ACCTPAY	In memory accounts payable system-storage permitted
79	INVOICE	Generate invoice on screen and print on printer
80	INVENT2	In memory inventory control system
81	TELDIR	Computerized telephone directory
82	TIMUSAN	Time use analysis
83	ASSIGN	Use of assignment algorithm for optimal job assign.
84	ACCTREC	In memory accounts receivable system-storage ok
85	TERMSPAY	Compares 3 methods of repayment of loans
86	PAYNET	Computes gross pay required for given net
87	SELLPR	Computes selling price for given after tax amount
88	ARBCOMP	Arbitrage computations
89	DEPRSF	Sinking fund depreciation
90	UPSZONE	Finds UPS zones from zip code
91	ENVELOPE	Types envelope including return address
92	AUTOEXP	Automobile expense analysis
93	INSFILE	Insurance policy file
94	PAYROLL2	In memory payroll system
95	DILANAL	Dilution analysis
96	LOANAFFD	Loan amount a borrower can afford
97	RENTPRCH	Purchase price for rental property
98	SALELEAS	Sale-leaseback analysis
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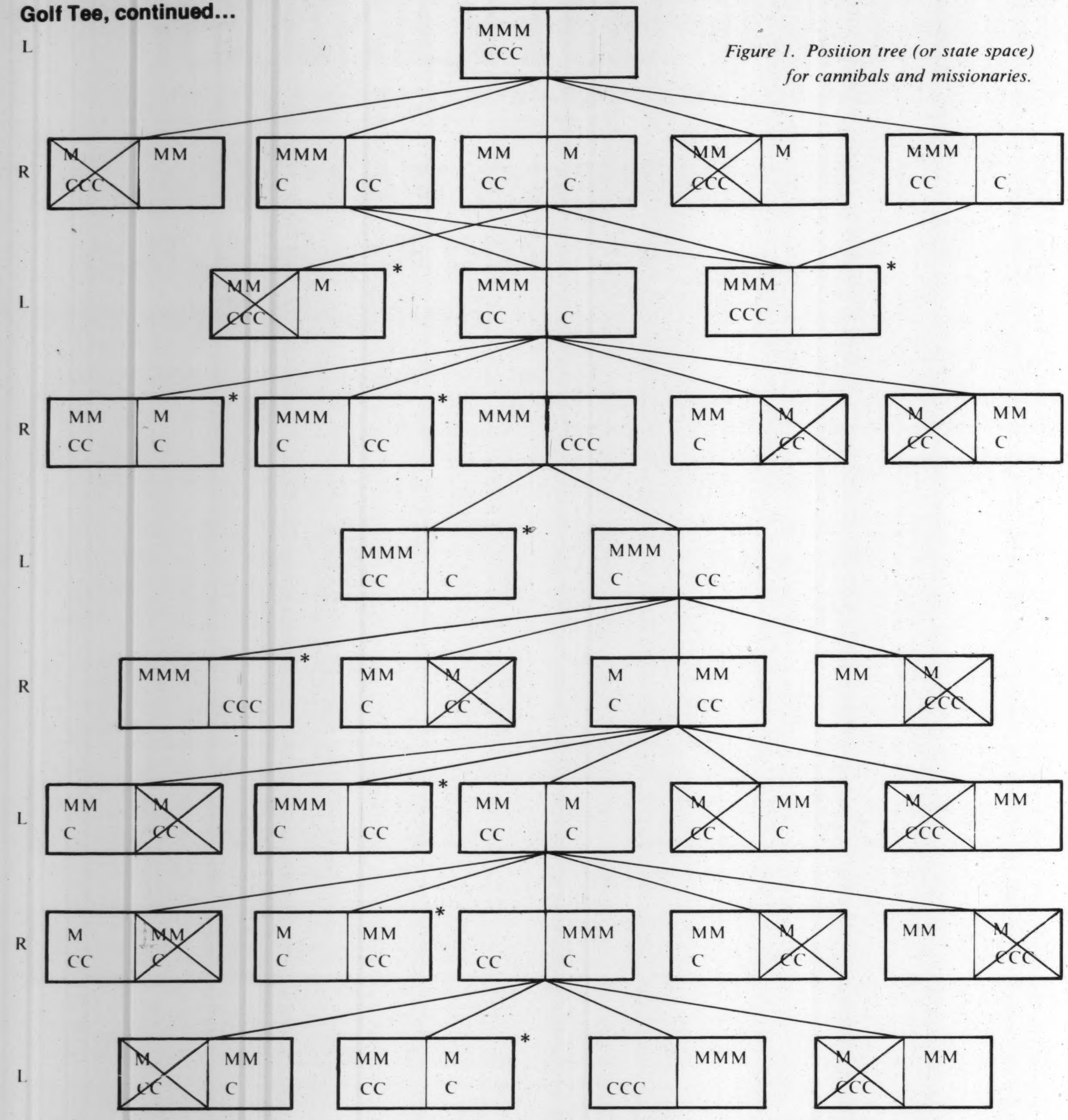
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M CCC | MM

Figure 1. Position tree (or state space) for cannibals and missionaries.

to defeat checkers masters.

One secret to Samuels' success was the organization of board positions into a tree. Each board position was a node in the tree, and positions obtainable through a single move were stored as subnodes under the starting node.

Trees in most games are incredibly large, and cannot be examined exhaustively. Therefore, programmers introduce *heuristics* to teach the program to make intelligent guesses in the absence of complete information.

A typical heuristic for Samuels' checkers program was to examine whether the machine controlled the center of the board. Center control makes the position stronger.

In the case of the golf tee puzzle program, heuristics are not used. The program assumes that I will let it run long enough to examine all positions. While the search is certainly large, this approach is feasible for a small game.

The idea of a complete search of all positions (or the *state space* of the game) is nicely illustrated by the familiar cannibal and missionary problem. Figure 1 shows the complete tree for this problem.

Recall the situation: three cannibals and three missionaries are on the left bank of a river, and they have a two-person boat. The missionaries wish to cross the river, but are deterred by the fact that if missionaries are outnumbered by cannibals they will be eaten.

In Figure 1, the letters L and R indicate whether the boat is on the left or right bank of the river. A star (*) next to a node shows that the node (and its subtree) have already been explored and need not be considered further.

The topmost box shows all six people and the boat on the left bank. There are five possibilities from here: two of them

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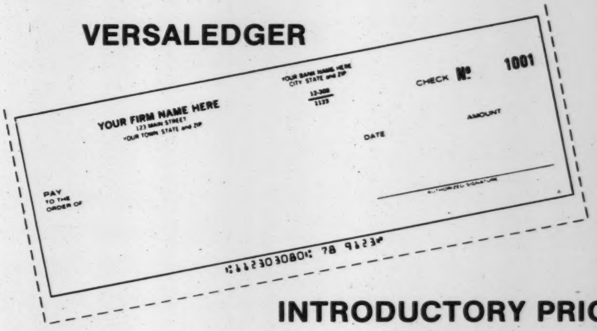

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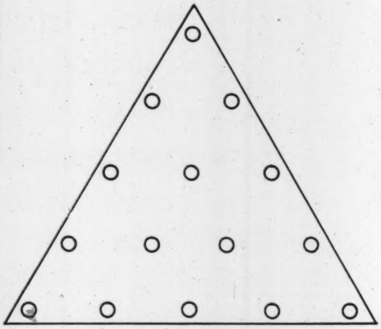

Figure 2. The board.

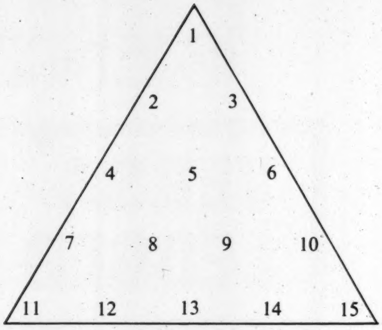

Figure 3. The hole encoding.

result in the immediate demise of one or more missionaries. The other three are to take a cannibal, a missionary, or one of each across the river. Following the tree down to the bottom yields a solution after eight river crossings. (Note that the cannibals could all cross the river in only two additional moves.)

> **A novice will soon discover that it is quite easy to end up with three pegs on the board.**

A similar tree will be built by the golf tee program to find a path from the 14-peg starting configuration to the one peg solution. At each position, the possible next moves are considered, and used to produce additional positions. The tree is not actually constructed in the memory of the computer, but examined one small piece at a time, by systematically hopping from one branch to the next. But I digress . . . more about this later.

There are two approaches to constructing trees: depth first and breadth first. A depth-first construction takes a path from the top straight down to the bottom, and examines only a vertical slice at any one time. The specific path chosen is not necessarily based on evaluating the "best" choice at each level, but focuses on rapid motion toward an end position.

A breadth-first approach, on the other hand, takes a look at all nodes of the current level, moving downward only to examine the entirety of the next level.

A breadth-first search requires enough memory to hold information about all nodes at the current (and possibly several past) levels. Depth-first, on the other hand, requires memory only to hold a node for each level passed through. This can be an important concern, particularly to users of small computers. The golf tee algorithm uses a depth first algorithm.

The Puzzle

The puzzle is played with some very simple equipment, and can be duplicated at home if desired. The board is a small triangular wooden block measuring about 6″ per side and ¾″ to 1″ thick. Set into this board are 15 holes in an arrangement shown in Figure 2.

To play, 14 pegs (golf tees will do nicely) are placed into 14 holes of the player's choice. Because of the symmetry of the board, there are only four unique starting configurations, but solutions are by no means equally distributed among the four configurations.

A move consists of jumping a peg from its current position over another peg and into an empty hole. The destination hole becomes filled with the jumping peg, and the peg which was jumped over is removed.

Jumps may take place only in a straight line on the board, but may go in any direction. Thus, if you start with the top corner open there are only two possible moves: you may bring up either the left or right hand center edge peg to the top corner hole, removing one peg from the second row.

You win if you jump in a sequence such that only one peg remains on the board after 13 moves.

A novice will soon discover that it is quite easy to end up with three pegs on the board. This is confirmed by computer analysis.

Approximately one half of all sequences from all the starting positions end up with

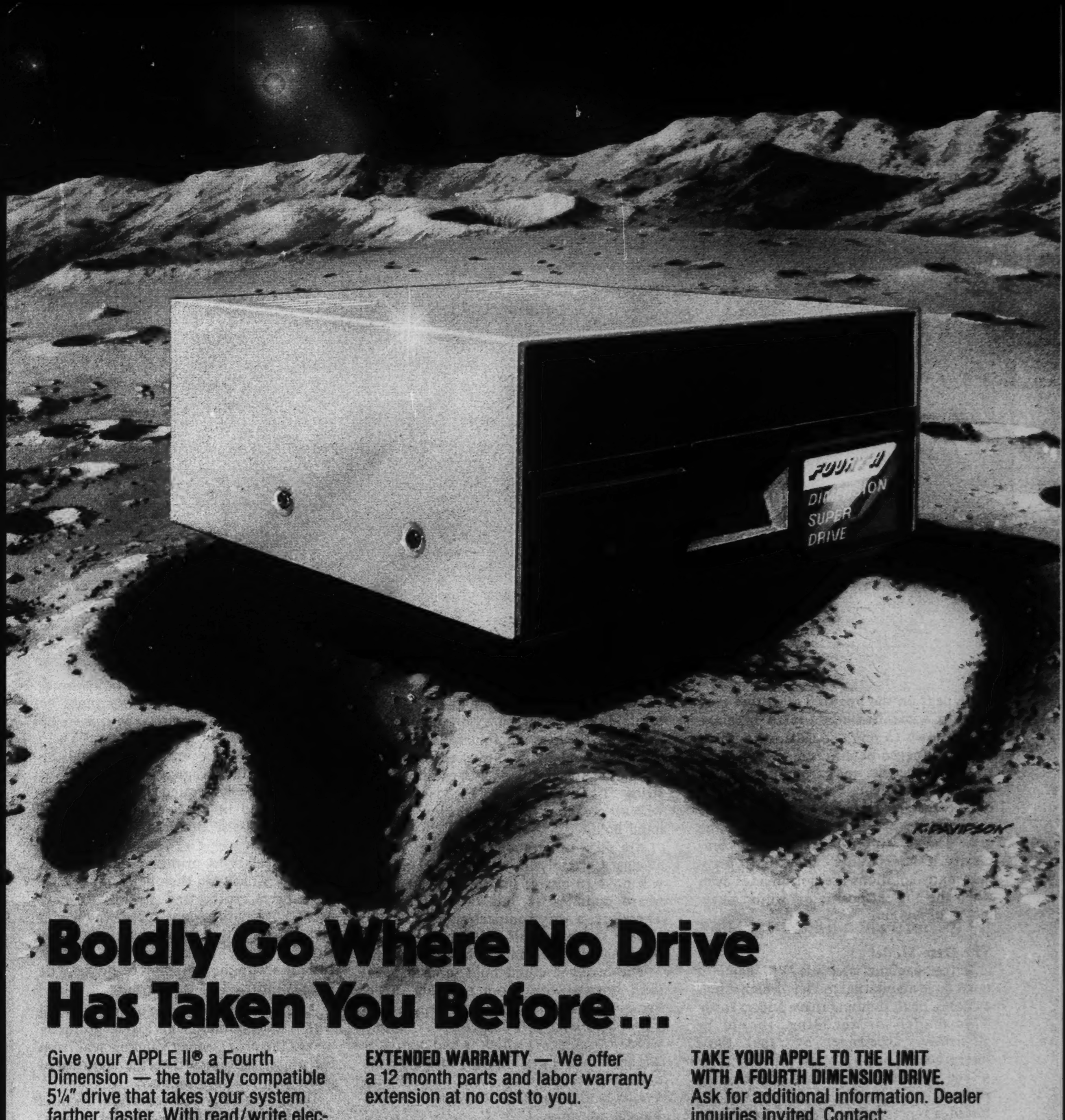

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Figure 4.

```
type board = array [1..15] of holes;
     holes = (peg, empty);
     game_stack =
          record pointer: int;
                 positions: array [1..STKSIZ] of board;
                 end;
var puzzle: board;
    stack: game_stack;
```

three pegs on the board. To get two pegs requires some fiddling, and to pare the board down to one peg calls for nothing short of dogged persistence.

After some trial and error, intermediate positions can be catalogued mentally, to be quickly reached from new positions. While the creature here is certainly not in the same league with Rubik's cube in complexity, it shares with the cube the property that many solutions are not obvious even when the current position is within a few moves of winning.

The Data Model

If the machine is to play the game, it must have an internal model of such things as holes, pegs, jumping rules, and so forth. This model, or encoding, should be efficiently accessible by the Basic interpreter.

The model chosen has three components: an encoding of the holes of the board, a representation for an instance of a board position, and "legal move arrays" defining legitimate peg jumps.

The encoding of the 15 holes is illustrated in Figure 3. The holes are numbered from 1 to 15. The fact that hole 1 is on top is arbitrary, as the board is symmetrical about the three corners.

I have chosen a 15-character string to represent a specific peg distribution. Each character is either a T or a period, meaning peg and no-peg respectively. The leftmost character in the string corresponds to hole number 1; the rightmost to hole number 15.

The use of strings makes a board directly printable, a handy feature while debugging programs. The string functions LEFT$, RIGHT$, and MID$ are used to access individual hole positions. For example, the string "TTTTTTTTTTTTTT." is a board with all positions filled but the lower right hand hole.

Are there other choices than the use of strings? Certainly. For starters, an integer will hold 16 bits of information, and the board contains 15 bits of information. Therefore, a very compact and seemingly elegant scheme would call for each bit in the integer to represent one hole in a board.

The machine could hold thousands of such boards with room to spare. (The machine I used to prepare the program, a TRS-80 Model III, has 24K or 16-bit words of memory, which is enough for a large number of peg boards.) There is even a leftover bit in each word as a bonus, available to use in some as yet unspecified but clever way.

Unfortunately, accessing the bits from TRS-80 Model III Basic is quite awkward. Furthermore, the algorithm does not require storage of more than one or two dozen board positions at any one time. It thus cannot take advantage of the compactness of the notation. Due to these drawbacks, I rejected the "bit per hole" encoding. Note that if the algorithm had needed to store more than just a few board positions, the storage savings inherent in this approach would have made it much more attractive.

Figure 5: Data model sequence.

Board Position	**Move**
.TTTTTTTTTTTTTT	(1,2,4)
T.T.TTTTTTTTTTT	(6,5,4)
T.TT..TTTTTTTTT	(1,3,6)
...T.TTTTTTTTTT	(7,4,2)
.T...T.TTTTTTTT	(10,6,3)
.TT....TT.TTTTT	(12,8,5)
.TT.T...T.T.TTT	(13,9,6)
.TT.TT....T..TT	(2,5,9)
..T..T..T.T..TT	(3,6,10)
........TTT..TT	(15,10,6)
.....T..T.T..T.	(6,9,13)
..........T.TT.	(14,13,12)
..........TT...	(11,12,13)
............T..	

Another possibility is to use arrays of integers where subscript 1 corresponds to hole 1, subscript 2 corresponds to hole 2, etc. Access to specific positions is here quite straightforward. In terms of space, each peg requires 2 bytes since there are no 1-byte integers in the TRS-80 Basic. This would not be objectionable; the only serious drawback is that they cannot be referenced in their entirety with a single name.

A better representation would be possible if the language included user defined and enumerated data types, such as are found in Pascal. Variables could then have been declared as shown in Figure 4.

This declares a primitive data type of "board," which can then be used as easily as integers, reals, and strings. "Holes" become primitive constructs which can take on only two values: peg or empty. Holes can be thought of as boolean variables with the two states being "peg" or "empty" instead of true or false.

A game stack is an array of boards along with a stack pointer. This logical grouping makes the programmer's intent clear from the outset with regard to the stacking of game positions during play.

Using this data representation, I would reap the benefits of indexed access, compiler-dependent space or time optimization, and mnemonic object reference all in one fell swoop.

Using the string data model, Figure 5 illustrates a sequence of string values which constitute a game solution. The notation for each move consists of three numbers. The first is the position of the jumping peg, the second is the hole which is jumped over, and the third is the position in which the jumping peg ends up. In a legitimate move, the peg in the middle position is removed.

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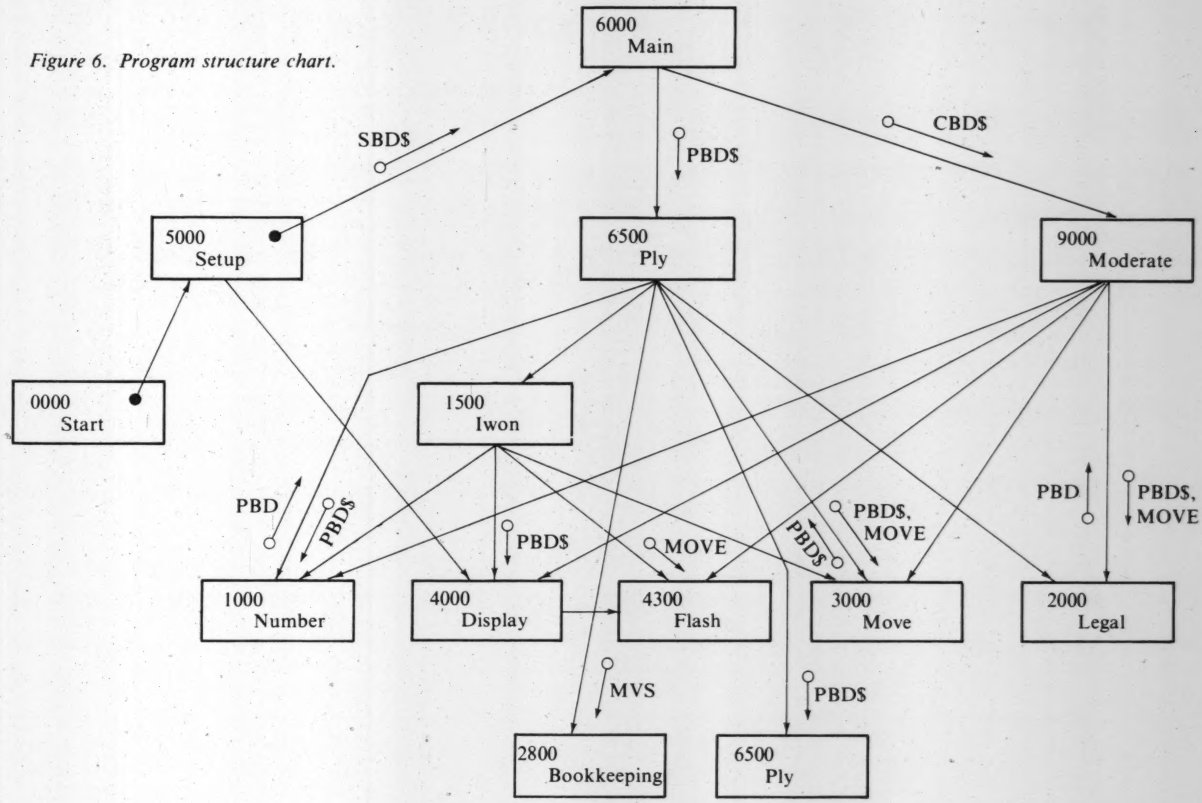
Figure 6. Program structure chart.



It turns out that there are exactly 36 such legitimate moves, and they are encoded in three arrays of length 36 each. They are called START, OVER, and FIN in the program. For a particular board configuration, fewer than 36 moves will be applicable.

The move generator is thus quite simple; each of the 36 possible moves is compared to the current board. If the START and OVER holes have pegs in them and the FIN hole is empty, then that move can be taken.

Program Logic

Figure 6 is a Yourdon type structure chart showing the modules comprising the program and how they relate to each other. Arrows connecting boxes indicate that the box pointed to is called or transferred to by the other box; arrows labelled with variable names show that the variable is either being passed into a subroutine or returned as a function value.

Only variables of major importance are actually drawn on the chart, as a complete diagram would be unnecessarily cluttered. Table 1 is a companion to the structure chart summarizing the function of each module. Table 2 describes the major program variables.

In Basic, module boundaries and calling parameters are somewhat artificial. Even in Basic, though, all is not lost. The systematic use of dummy module declarations helps to give the feeling that the whole program is composed of many independent and cohesive "building blocks."

Main

Referring to Figure 6, the Main routine is simple, as it should be. Lines 6000 through 6140 suffice to drive the entire game. These establish which mode is desired by the user, and then either GOSUB or GOTO other code to implement that mode. When the play ends, Main prints out summary statistics.

Start and Setup

You have now mastered the entire top level of the structure chart. Moving right along, the first module in level 2 is Start. Start executes a few DIM and initialization statements, and then jumps directly to Setup. This may seem a bit unstructured, but you have to start somewhere, right?

Setup does considerably more work than start did, so things should begin to get interesting. The first step in Setup is to read in from DATA statements the values of the START, OVER, FIN, and PAT arrays. Recall that corresponding elements of START, OVER and FIN define a legal peg jump sequence.

The numbers in these arrays are therefore the embodiment of the knowledge the program has regarding how to play the game. The PAT array contains the screen co-ordinates of each of the 15 hole positions. It is used by Display and Flash.

Statement 5140 is worthy of mention here, as it makes this part of the program "self checking." The statement reads in an additional data item with a uniquely recognizable value.

If a typographical error has occurred in the previous data list, then this unique data value will not be read into the check variable. (Numeric transpositions will not be trapped by this test, unfortunately. I leave it as an exercise for the reader to construct a checking scheme which can detect these and other errors.)

Setup makes use of the INKEY$ function to perform I/O in an unusual way. I wanted Setup to blink the picture of each hole on the computer screen while the user was deciding whether to put a peg

Table 1.

Program Module Summary

Line Number	"Declaration"	Function
0000	Start	Declaration of variables; DIMs; Identifies comments and version.
1000	Number(PBD$)	Returns in PBD the number of pegs in PBD$.
1500	Iwon	Called by Ply whenever a winning board is generated.
2000	Legal(PBD$,move)	Returns PBD=1 if "move" applied to PBD$ is legal, PBD=0 otherwise.
2800	Bookkeeping()	Called by Ply to gather statistics whenever a legal move is generated.
3000	Move(PBD$,move)	Applies "move" to PBD$, and returns the new PBD$.
4000	Display(PBD$)	Draws PBD$ as a graphic on the CRT.
4120	Redraw(PBD$)	Same as Display, but does not clear screen or draw enclosing triangle.
4300	Flash(move)	Using animation, performs "move" on the CRT; assumes board image is already on screen.
5000	Setup	Reads in legal move array and gets an initial peg configuration from the user.
6000	Main	Driver for mainline logic; starts play in either of the two modes.
6500	Ply(PBD$)	Generates one ply of the game tree by invoking itself for each subtree under the current level.
9000	Moderate	Logic to interactively moderate an attempted solution by the user.

Table 2.

Major Program Variables

Name	Function
	** Legal Move Definition **
START(36),OVER(36),FIN(36)	These three arrays define which peg jump combinations constitute legal jumps. For example, START(1) = 1, OVER(1) = 2, and FIN(1) = 4, which means that peg 1 can jump over (and remove) peg 2 landing in peg slot 4.
	** Automatic Variables **
CBD$(14)	The "Current BoarD" array holds a copy of the board generated for each level of recursion.
MOVE(14)	The "move" array holds the move currently under consideration at each level of recursion.
EDGMS(14)	The "EnD GaMeS" array is a counter of the number of games for which there were no sub trees at each level of recursion.
STKPTR	The "STacK PoinTeR" keeps track of the current level of recursion.
	** Miscellaneous **
PAT(15)	The address in CRT "PRINT @" co-ordinates of each hole in the board.
PBD$	A string used to contain a copy of the current board when passed as a parameter to a subroutine or function.
SOLS	Counts the number of solutions found so far.
MVS	Counts the number of pegs moved so far.
HRDCPY	A flag to represent whether hard copy on the printer is desired. 1 means produce hard copy, 0 means no hard copy.
CRT	A flag to represent whether discovered solutions should be flashed on the CRT when found or not. 1 means YES, 0 means NO.
PSREPORT	An integer meaning the interval between each status report on the CRT. Status reports are helpful in assessing the progress of the program as it goes along.
REPORT	An integer representing the interval at which discovered solutions are to be reported.

there or not. A quick scan of the TRS-80 manual convinced me that Radio Shack did not provide a "blink" mode.

Further, if the program asks the user for a response through the INPUT statement, it cannot also blink any displays. What to do? INKEY$ to the rescue.

INKEY$ is a built-in function which returns immediately with the value of the most recently pressed key on the keyboard. If a key has not been pressed since the keyboard was last sampled, INKEY$ returns an empty string. Otherwise, INKEY$ returns the character pressed as a string of length one.

This allowed me to write the logic between 5345 and 5480 where the computer sends out alternating light and dark characters to continuously blink on the screen while waiting for keyboard input.

Ply

The Ply module is the most fascinating of all the modules. It contains the heart of the game model. The job of Ply is to take a single board configuration and generate from it all possible ways to play that board out to end positions. The algorithm can be concisely summarized with the piece of pseudo code in Figure 7.

Notice that Ply can only do real work when it is handed a board from which no more moves can be made. Under these circumstances, it figures out whether play is blocked because you have found a solution or because there are simply no moves to be made.

These two cases are reported differently, if the board is a solution, a special module is invoked (Iwon) to celebrate appropriately. Iwon has several options having to do with the way the user wishes to record each victory. The most fun is to have Iwon replay with animation the entire winning sequence one move at a time.

If you are not looking for any single win, but the accumulation of a great many winning games, another option allows you to print out sequence summaries on the screen or the printer (if you have one).

Whenever a solution is found, the variable SOLS is incremented. If the board has more than one peg left, then you have simply become stuck. This is recorded in the variable EDGMS (EnDGaMeS).

EDGMS has one element for each ply of the game tree, and the value at each level represents the number of times a board was generated at that level from which no further moves could be made. (At level 14, this value is equal to SOLS.)

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CIRCLE 170 ON READER SERVICE CARD

```
procedure ply(PBD$):

        if "there are no more moves possible on PBD$"

          then begin if "there is only one peg left"

                        then "you win" else "you're stuck"

                        end

          else for each possible move  do

                      ply(move(PBD$))

        end
```

Figure 7.

Let's go back to the way Ply deals with boards which are not end games. If any possible moves from the board are passed into Ply as a parameter, Ply decides that the situation is too complicated for it to handle by itself, and it calls on some helpers to work on sub-problems.

Ply knows that there are never more than 36 possible moves from any one board. It therefore divides the problem into 36 smaller problems, one for each new board produced by applying a move to the board it was given. The helpers it needs turn out to be copies of itself.

This is perfectly reasonable, since Ply is defined to analyze all games playable from a given starting configuration. Each helper copy of Ply sees the same situation as its caller, namely a board configuration and instructions to find all playable games.

Helper configurations are always *exactly* one peg smaller than their caller configurations. (Convince yourself that this is the case.) Since configurations must have between 0 and 15 pegs, no more than 14 levels of helpers will be called. Actually, a board with 15 pegs on it is stuck, so 13 is the true limit of depth of calling.

To summarize, each copy of Ply will examine its board: if there are no moves to be made, Ply performs appropriate notification. If there are some moves, then it calls a helper copy of Ply for each move, and gives the helper copy the board implied by making that move on the board of the current Ply.

At this point it is appropriate to reflect on the nature of the Ply algorithm. There was talk at the beginning of the article on the subject of representing the "state space" of the game as a tree, and then traversing the tree in depth-first order. Well, do you see any declarations of "TREE" data structures in the code?

The fact is that there are no explicit declarations of any variables taking the shape of a tree. (There is a stack, but stacks and trees are different.)

The Ply algorithm develops the tree *implicitly* by the order in which it generates board positions and invokes helper copies to analyze them. This is perfectly all right, and as it happens, *not* making a copy of the entire state space is what allows the program to fit into a TRS-80 in the first place. The representation of legal moves as an ordered sequence of array elements is what lets the program keep track of which branch of the tree is being considered by which copy of Ply.

There are two problems with this kind of algorithm written in Basic that I have not yet mentioned. The first is keeping track of subroutine return addresses (remember, Ply must return into itself), and the second is providing each copy of Ply with its own copy of its variables. These are not as formidable as they might at first seem.

The return address problem has been thoughtfully solved for us by the Tandy Corporation. To wit, return addresses from GOSUBs are pushed onto an internal stack, such that returns go to callers in the inverse order from which they were called. All such addresses are treated as 16-bit numbers, and the machine does not care whether the programmer nests calls or not.

The second problem, that of providing each copy of Ply with its own variables, requires some programming to solve. In a manner analogous to the handling of return addresses, Ply keeps a stack of variables whose values must differ in each copy of the module.

Upon entry to Ply, these variables are preserved at the top of the stack and new values are created for the copy just entered. The saved values represent the variable context of the caller copy of Ply; the new values are used by the current (or helper) copy.

When Ply exits, the reverse process takes place. Copies of the variables are fetched from the stack and made the current copies. Thus, as far as each copy is concerned, the values of its variables are not affected by its helpers.

In the listing, these variables are noted as "automatic" variables, since in other languages this term is used to describe the fact that space is automatically allocated from the stack at each entry.

The net effect of the above algorithm is to perform a depth-first walk through an n-ary tree representing all possible board configurations reachable from the starting board. For any 14-peg configuration, this tree is quite large.

It might be reasonable to redefine the problem statement to allow the program to find all solutions which are "significantly" different from each other. This would result in what is commonly called "pruning" the tree.

Many game playing programs have a component missing in this one. That is, as each board position is generated, a module is invoked to assign a weight to that board. The weights serve to rank the generated boards in terms of how likely a board is to lead to a winning position later.

In this case, there are no weights as such, but it does make sense to talk about groups of solutions which are so similar that as far as the player is concerned, producing any one of them is adequate to describe them all.

If solutions (and entire sub-trees) could be so organized that only a single prototypical sequence was produced for each group of similar sequences, then this grouping would effectively prune the tree. Under these conditions, the program would run to completion in substantially less time than under the simpler algorithm described above, particularly if the pruning could take place at the upper levels of the tree.

Pruning

Such a pruning strategy consists of having the Legal module recognize certain classes of board symmetry, and return as legal only those moves on a single side of the symmetric relation. Figure 8 shows an example of symmetric peg configuration. Regardless of whether move 1 or move 2 is made, subsequent play remains the same.

The two resulting subtrees of configurations are identical except for left-right symmetry, and need not both be considered. There are bilateral symmetries around the three perpendicular bisectors of the three edges. (No pruning strategy is implemented in the program.)

Another pruning strategy (unfortunately not implemented in the program either) is a mechanism for remembering board positions which have already been examined and skipping over them. When you consider the effects of rotation and symmetry, there are likely to be many large subtrees currently examined by the program unnecessarily. This kind of strategy is complicated by the fact that accessing and comparing the current board to previous boards can be extremely time-consuming. The solution will require not

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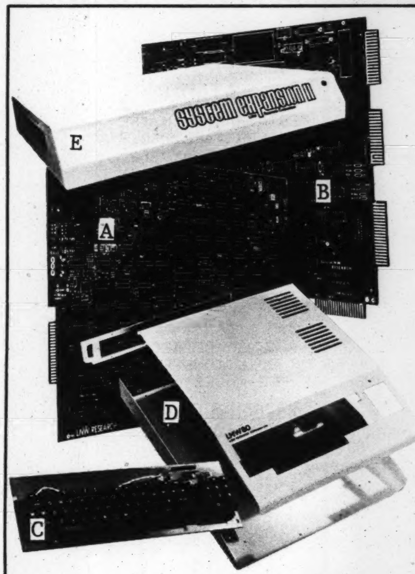

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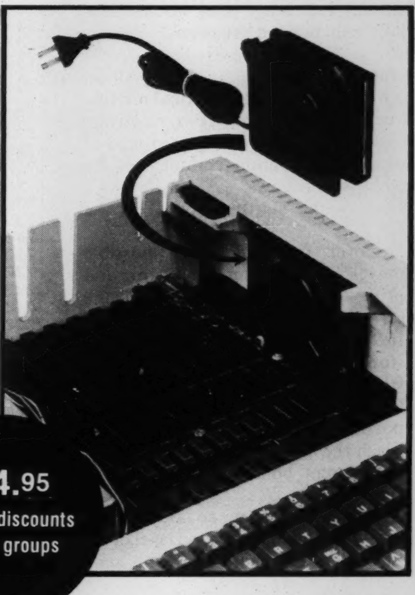

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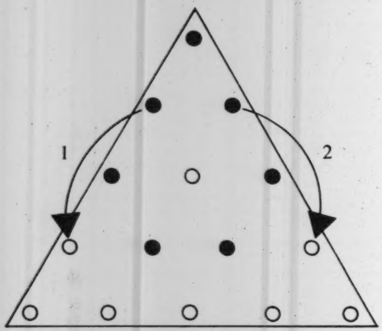

Figure 8. Symmetric board showing possible pruning.

only a compact storage notation for boards, but an efficient indexing scheme for relating new positions to old ones.

To set Ply into the context of other game simulations, it has been shown to have a data model, a move generator, a tree constructor, no board evaluator, and no implemented pruning strategy. The data model is the string representation of the board; the move generator is a FOR-NEXT loop in combination with the legal move arrays; the tree constructor is the recursive Ply logic; and the board evaluator is not necessary since a complete tree traversal is being made. A pruning algorithm has been omitted for the sake of exposition; including one would substantially enhance the program.

Moderate

The Moderate module (the final module of structure chart level 2) is relatively simple. It is selected by the user instead of Ply when the program commences. Its algorithm is as follows:

1. Display the starting board on the CRT.
2. Discover from Legal all possible moves from the current board, and print them on the bottom of the screen.
3. If there were no possible moves, then stop and print out whether the player won or lost.
4. Prompt for and get from the player a possible move.
5. Flash the move on the screen, update the current board, and go back to step 2.

If you have followed me so far, you have completely mastered the second level of the structure chart in Figure 6. If you can't remember anything about the structure chart of Figure 6, then you probably fell asleep somewhere back in the last few columns and you should probably go on to the next article. Otherwise, I will wrap up the program logic with a few words about some of the building block modules on lower levels.

```
10 REM   --- GOLF TEE PUZZLE ---
20 REM
30 REM   DAVID A. BENNETT
40 REM   WRITTEN JAN 1980
50 REM   REVISED FOR TRS MODEL III BASIC, JULY 1981
60 REM
61 REM  THIS PROGRAM GENERATES SOLUTIONS TO THE TRIANGULAR
62 REM  GOLF TEE PUZZLE (OFTEN FOUND IN RESTAURANTS IN THE
63 REM  NORTHEAST).  IT HAS TWO MODES: 1) FINDS  ALL  SOL-
64 REM  UTIONS GIVEN ANY STARTING CONFIGURATION,   AND  2)
65 REM  LETS A USER TRY TO FIND HIS/HER  OWN SOLUTIONS  BY
66 REM  ACCEPTING PEG MOVES INTERACTIVELY, AND THEN  SHOW-
67 REM  ING THEIR EFFECTS ON AN "ELECTRONIC BOARD."
68 REM
69 REM                         VERSION 2.2   8/9/81
70 REM      --- DECLARATION OF ARRAYS ---
80 DIM PAT(15),START(36),OVER(36),FIN(36)
90 DIM CBD$(14),EDGMS(14),MOVE(14),ILLEGALS(14)
100 REM    --- GLOBAL VARIABLE INITIALIZATION ---
110 TRUE=1: FALSE=0
120 STKPTR=0   :REM  STKPTR IS THE CURRENT LEVEL OF RECURSION
130 SOLS=0     :REM  SOLS IS THE NUMBER OF SOLUTIONS FOUND
140 MVS=0      :REM  MVS IS THE NUMBER OF PEG MOVES MADE
150 GOTO 5000
1000 REM "NUMBER(PBD$)"
1010 REM  RETURNS IN PBD THE NUMBER OF PEGS LEFT IN PBD$
1020 PBD=0: FOR J=1 TO 15
1030 IF MID$(PBD$,J,1)="T" THEN PBD=PBD+1
1040 NEXT J
1050 RETURN
1500 REM "I WON!"
1510 REM  INVOKED BY "PLY" WHEN A WINNING GAME IS FOUND
1520 SOLS= SOLS+1
1530 IF SOLS/REP <> INT(SOLS/REP) THEN RETURN
1540 IF HRDCPY <> TRUE THEN GOTO 1630
1550 PRINT " "
1560 PRINT "------- WIN NUMBER ";SOLS;"  MOVE NUMBER ";MVS;"--------"
1570 LEVEL=1
1580 PRINT "MOVE #";LEVEL;":";START(MOVE(LEVEL));"->";FIN(MOVE(LEVEL))
1590 PRINT "BOARD";CBD$(LEVEL);" MOVE";START(MOVE(LEVEL));"->"
     ;FIN(MOVE(LEVEL))
1610 LEVEL=LEVEL+1
1620 IF LEVEL < 15 AND CBD$(LEVEL)<>"" THEN GOTO 1580
1630 REM  ... NOW FOR THE CRT
1640 IF CRT <> TRUE THEN RETURN
1650 INPUT "READY FOR CRT DISPLAY OF WIN";X$: CLS:LEVEL=1
1654 PRINT @0,"SOLUTION #";SOLS;
1655 PBD$= CBD$:  GOSUB 3000
1657 CBD$(STKPTR+1)= PBD$: MOVE(STKPTR)=MOVE
1660 PBD$= CBD$(1)
1670 GOSUB 4000
1680 MOVE=MOVE(LEVEL)
1690 PRINT @896,"HIT <ENTER> WHEN READY FOR NEXT MOVE";
1700 INPUT T$
1710 GOSUB 4300 : REM FLASH THE MOVE
1720 PBD$= CBD$(LEVEL+1)
1730 GOSUB 1000 : REM COUNT THE PEGS AGAIN
1735 LEVEL=LEVEL+1
1740 IF PBD <> 1 THEN GOTO 1680
1760 PRINT @896,"THE SEARCH CONTINUES...                    "
1770 RETURN
2000 REM "LEGAL(PBD$,MOVE)"
2010 REM RETURN IN PBD 0 IF MOVE IS ILLEGAL, 1 IF LEGAL
2020 PBD=0
2030 IF MID$(PBD$,START(MOVE),1)="."THEN RETURN
2040 IF MID$(PBD$,OVER(MOVE) ,1)="."THEN RETURN
2050 IF MID$(PBD$,FIN(MOVE)  ,1)="T"THEN RETURN
2060 PBD=1: RETURN
2800 REM "BOOKKEEPING ON EACH LEGAL MOVE"
2810 MVS=MVS+1
2820 IF INT(MVS/PSREPORT)<>MVS/PSREPORT THEN RETURN
2830 PRINT "STATUS:"
2840 PRINT MVS;"MOVES,";SOLS;"SOLUTIONS,";
2850 X=0: FOR J=1 TO 14
2860 X=X+EDGMS(J) : NEXT J
2870 PRINT X;"GAMES COMPLETED."
2880 RETURN
3000 REM "MOVE(PBD$,MOVE)"
3010 REM   CHANGES PBD$ TO REFLECT MOVE
3020 TB$=LEFT$(PBD$,START(MOVE)-1)+"."+RIGHT$(PBD$,15-START(MOVE))
3030 TB$=LEFT$(TB$,OVER(MOVE)-1)+"."+RIGHT$(TB$,15-OVER(MOVE))
3040 PBD$=LEFT$(TB$,FIN(MOVE)-1)+"T"+RIGHT$(TB$,15-FIN(MOVE))
3050 RETURN
4000 REM "DISPLAY (PBD$)"
4010 REM  DISPLAY THE BOARD ON THE CRT
4020 REM  FIRST, DRAW AN ENCLOSING TRIANGLE
4030 FOR J=35 TO 95: SET (J,35): NEXT J
4040 X=95: Y=35: DY=9
```

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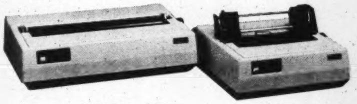

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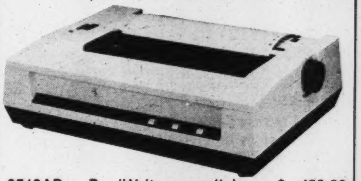

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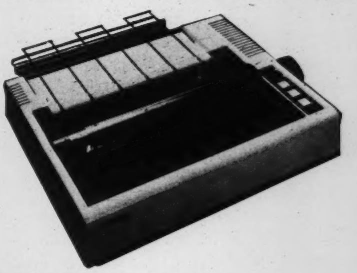

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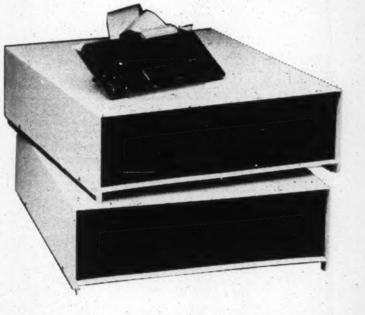

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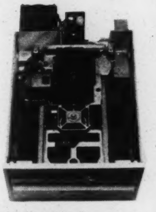

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CIRCLE 112 ON READER SERVICE CARD

Golf Tee, continued...

The Building Blocks

The Number and Legal routines are both quite simple, so they will be dealt with first. Number is an integer valued function (not bad for Basic) which returns the number of pegs in a board configuration passed to it as a parameter. It uses a FOR-NEXT loop and the substring extraction function MID$ to isolate and count pegs in a string variable array.

Legal is a boolean valued function (that is, it returns one of two values) indicating whether a specific move can be made on a specific board configuration. Of course, the words "function" and "parameter" must be taken with a large dose of salt; however, I feel it is essential to follow reasonable programming conventions in order to make the components of a software system independent of each other, even when the conventions are not encouraged by the interpreter at hand.

Move is a module of two parameters: a board configuration and an integer representing a move. It modifies the board parameter to reflect the fact that the move has been made. Note that Move does no error checking, and as a result will make some pretty outrageous moves if you ask it to. Bookkeeping is called only by Ply, and its job is to do whatever seems appropriate to note the passing of a move. Right now it counts them, and will provide a status report on the progress of the program through the state space at regular intervals.

The final (and perhaps most interesting) module in the building block collection is the Display routine. This is because it contains a modification of Bresenham's algorithm to interpolate points on the line used in drawing a triangle on the CRT. An interpolation algorithm is needed because I wanted to draw a picture of the triangle on the CRT.

Such an algorithm approximates straight lines of arbitrary slopes on plotting devices with point addressability. The alternative would be to encode each point of the line separately in a DATA statement. I felt this to be prohibitively tedious.

The basic algorithm can be expressed in Pascal in Figure 9, and assumes e, x, and y real, and deltax, deltay are integers.

The version used in the program has been converted to use integers exclusively, and has the parameters factored in as constants.

A note about the TRS-80 Model III graphics is in order here to help explain Display. The CRT can be directly addressed under program control. That is, a programmer may position text anywhere on the screen, and may also selectively turn on or off any single picture element (pixel). Text is positioned using the "PRINT @" command (see line 4130).

```
4050 SET(X,Y): X=X-1: Y=Y-1: DY=DY-1
4060 IF X=64 THEN GOTO 4080
4070 IF DY<>0 THEN GOTO 4050
4075 DY=9: X=X+1: GOTO 4050
4080 X=64: Y=3: DY=9
4090 SET(X,Y): X=X-1: Y=Y+1: DY=DY-1
4095 IF X=34 THEN GOTO 4110
4100 IF DY<>0 THEN GOTO 4090
4105 DY=9: X=X+1: GOTO 4090
4110 REM -- NOW FILL IN PEGS --
4120 FOR J=1 TO 15
4130 IF MID$(PBD$,J,1)="T"THEN PRINT@PAT(J), CHR$(171); ELSE PRINT @PAT(J),
     CHR$(160);
4140 NEXT J
4150 RETURN
4300 REM "FLASH(MOVE)"
4310 REM   THIS PROCEDURE FLASHES THE BOARD ON THE CRT TO INDICATE
4320 REM   A MOVE MADE, LEAVING THE CRT AS IF THE MOVE
4330 REM   HAD BEEN MADE.
4340 A(1)=START(MOVE): A(2)=OVER(MOVE): A(3)=FIN(MOVE)
4350 FOR J=1 TO 3
4360 FOR J1= 1 TO 3
4370 PRINT @PAT(A(J)),CHR$(191);
4380 FOR J2=1 TO 5: NEXT J2
4390 PRINT @PAT(A(J)),CHR$(128);
4400 FOR J2=1 TO 5: NEXT J2
4410 NEXT J1
4420 IF J=3 THEN PRINT @PAT(A(J)),CHR$(171); ELSE PRINT @ PAT(A(J)),
     CHR$(160);
4430 NEXT J
4440 RETURN
5000 REM "SETUP INITIAL ARRAYS, GET START FROM USER"
5010 REM   FIRST, THE LEGAL MOVE ARRAYS
5020 DATA 1,1,2,2,3,3,4,4,4,4,5,5,6,6,6,6
5030 DATA 7,7,8,8,9,9,10,10,11,11,12,12,13,13
5040 DATA 13,13,14,14,15,15
5050 FOR J=1 TO 36: READ START(J): NEXT J
5060 DATA 2,3,4,5,5,6,2,5,8,7,8,9
5070 DATA 3,5,9,10,4,8,9,5,8,5,6,9
5080 DATA 7,12,13,8,12,8,9,14,9,13,14,10
5090  FOR J=1 TO 36: READ OVER(J): NEXT J
5100 DATA 4,6,7,9,8,10,1,6,13,11,12,14
5110 DATA 1,4,13,15,2,9,10,3,7,2,3,8
5120 DATA 4,13,14,5,11,4,6,15,5,12,13,6
5130 FOR J=1 TO 36: READ FIN(J): NEXT J
5140 DATA 1234: READ J
5150 IF J<>1234THEN PRINT "DATA CHECK AT LINE 5150":GOTO 9999
5160 REM NOW GET VALUES FOR PEG SCREEN ADDRESSES
5170 DATA 160,286,290,412,416,420,538,542,546
5180 DATA 550,664,668,672,676,680
5190 FOR J=1 TO 15: READ PAT(J): NEXT J
5200 REM "GET AN INITIAL BOARD FROM THE USER"
5210 PBD$="...............": SBD$="..............."
5220 CLS
5230 PRINT "----- GOLF TEE PUZZLE SOLVER -----"
5240 PRINT
5250 PRINT "This program accepts an initial peg configuration"
5260 PRINT "and finds all solutions to the puzzle, displaying"
5270 PRINT "them either on the line printer or on the screen."
5280 PRINT
5290 PRINT "The  program  can start with  any  combination of"
5300 PRINT "tees, and will play these out to all end games."
5310 PRINT
5320 PRINT "Please answer the following questions, to get going:"
5321 PRINT "Print results on the printer (Y/N)";:INPUT T$
5322 IF LEFT$(T$,1)="Y" THEN HRDCPY=TRUE ELSE HRDCPY=FALSE
5323 INPUT "Status report interval"; PSR
5324 PRINT "Interval for printing solutions";:INPUT REP
5325 INPUT "Display winning games on CRT (Y/N)";T$
5326 IF LEFT$(T$,1)="Y"THEN CRT=TRUE ELSE CRT= FALSE
5330 CLS: PRINT "INITIAL BOARD ENTRY:";
5340 GOSUB 4000: REM SHOW AN EMPTY PUZZLE
5345 PRINT @832,"       T=Enter a tee, <SPACE>=No tee, all else means go on."
5350 FOR PEG =1 TO 15
5360 REM BLINK THE CURRENT PEG
5370 PRINT @PAT(PEG),CHR$(191);
5380 FOR J1=1 TO 20: NEXT J1
5390 PRINT @PAT(PEG),CHR$(128);
5400 FOR J1=1 TO 20: NEXT J1
5410 K$=INKEY$
5420  IF K$="" THEN GOTO 5370
5430 IF K$<>"T" THEN GOTO 5460
5440 SBD$=LEFT$(SBD$,PEG-1)+"T"+RIGHT$(SBD$,15-PEG)
5450 PRINT @PAT(PEG),CHR$(171);: GOTO 5480
5460 IF K$<> " " THEN GOTO 5490
5470 SBD$=LEFT$(SBD$,PEG-1)+"."+RIGHT$(SBD$,15-PEG)
5475 PRINT @PAT(PEG),CHR$(160);
5480 NEXT PEG
5490 REM ....  DONE WITH INITIAL BOARD
```

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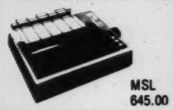

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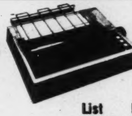

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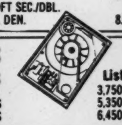

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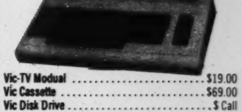

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CIRCLE 187 ON READER SERVICE CARD

```
e := (deltay/deltax) - 0.5;

for i := 1 to deltax do begin

     plot(x,y);

     if e>0  then begin

          y := y + 1;

          e := e - 1;

          end;

     x := x + 1;

     e := e ± (deltay/deltax);

     end;
```

Figure 9.

For the purpose of the PRINT @ function, character positions are numbered left to right, top to bottom between 0 and 1023 with 64 characters per line. Another capability is provided by the SET command. SET considers the CRT to be broken up into a grid of 128 by 48 pixels. The (0,0) pixel point is the upper left hand corner. Line 4050 uses SET to draw interpolated straight lines.

Conclusions

Should you have the sheer tenacity to key the entire program into your own computer, you will discover something immediately. That is, the program takes a long time to analyze an entire game. On the machine I am using, it generates a legal move about every 4 or 5 seconds. A useful exercise for the bold reader would be to recode the logic in assembly language and also to develop some effective tree pruning strategies as discussed above.

I have run a variant of the program on the PDP-11/70 computer using Fortran. The Fortran version included additions to the Legal module to recognize certain classes of board symmetry, and to prune the examined subtrees accordingly. Under these conditions, about two hours were needed to find all solutions to a 14-peg configuration. Incredibly, when you start with a corner hole empty, there are 13,426 unique solutions after pruning for symmetry! Starting with the center hole empty yielded the fewest solutions; there were only 775. To get some feel for the magnitude of the problem, there are 239,831 ways to lose when you start with a corner empty.

This program has served as an introduction to the world of game playing, modeling, and simulation. There are many more games waiting to be modeled and played; all you need to create them is your trusty computer, your imagination, and Basic. ☐

```
6000 REM  START OF MAINLINE CODE
6010 CLS: PRINT "OK, now let's get down to business."
6015 PRINT: PRINT "There are two modes of play:"
6016 PRINT "  1)I will find the ways to win the board you"
6017 PRINT "     just entered, or"
6018 PRINT "  2)I will moderate your attempt to win the game."
6019 PRINT
6020 INPUT "Select 1 or 2, please";J
6030 IF J=2 THEN GOTO 9000
6040 PRINT " ":PRINT "  ...THEN LET THE GAME BEGIN!"
6050 PBD$=SBD$
6060 GOSUB 6500   : REM  DO ALL THE STUFF!!
6070 PRINT "----- PLAY HAS ENDED -----"
6080 PRINT MVS;" MOVES MADE DURING PLAY."
6090 PRINT "COMPLETED GAMES AT EACH LEVEL ARE:"
6100 FOR J=1 TO 14
6110 PRINT "LEVEL:";J;EDGMS(J);"   ";
6115 IF J=3 OR J=6 OR J=9 OR J=12 THEN PRINT " "
6120 NEXT J: PRINT " "
6130 PRINT SOLS;"TOTAL SOLUTIONS TO PUZZLE"
6140 END
6500 REM "PLY(PBD$)"
6510 REM  PLY RECURSIVELY FINDS ALL BOARD POSITIONS STARTING
6520 REM  FROM PBD$ (INCLUDING WINS).  IF THERE ARE NO
6530 REM  LEGAL MOVES FROM PBD$, PLY RETURNS.  OTHERWISE,
6540 REM  FOR EACH LEGAL MOVE IT CALLS PLY WITH THE BOARD
6550 REM  DERIVED BY MAKING THAT MOVE TO PBD$.
6560 REM
6570 REM     FIRST, SAVE VALUES OF AUTOMATIC VARIABLES
6580 CBD$(STKPTR) = CBD$: CBD$= PBD$
6590 EDGMS(STKPTR)= EDGMS: EDGMS= EDGMS(STKPTR+1)
6600 MOVE(STKPTR)= MOVE
6610 ILLEGALS(STKPTR)= ILLEGALS: ILLEGALS=0
6620 STKPTR=STKPTR+1
6630 FOR MOVE= 1 TO 36
6640 PBD$=CBD$: GOSUB 2000 : REM CHECK BOARD FOR LEGALITY
6650 IF PBD=1 THEN GOTO 6700
6660 REM  ... THIS MOVE IS ILLEGAL
6670 ILLEGALS= ILLEGALS+1
6680 GOTO 6780
6690 REM  ... THIS MOVE IS OK
6700 GOSUB 3000 :REM APPLY MOVE TO PBD$
6710 GOSUB 2800 :REM DO ANY REQUIRED BOOKKEEPING
6720 GOSUB 1000 :REM HOW MANY PEGS LEFT?
6730 IF PBD <> 1 THEN GOTO 6760
6740 REM  ... THIS MOVE IS A WIN
6750 GOSUB 1500 :REM DO ANY GOOD STUFF WHEN YOU WIN
6760 REM  NOW CALL PLY ON BOARD DERIVED FROM MOVE
6770 GOSUB 6500
6780 NEXT MOVE
6790 REM IF NO MOVES WERE LEGAL, NOTE THIS AS AN ENDGAME
6800 IF ILLEGALS=36 THEN EDGMS=EDGMS+1
6810 REM RETURN AFTER RESTORING AUTOMATIC VARIABLES
6820 EDGMS(STKPTR)= EDGMS
6825 STKPTR= STKPTR-1
6830 ILLEGALS = ILLEGALS(STKPTR)
6840 MOVE = MOVE(STKPTR)
6860 CBD$=CBD$(STKPTR)
6870 EDGMS=EDGMS(STKPTR)
6880 RETURN
9000 REM  LOGIC TO MODERATE A PERSON DRIVEN GAME.
9010 CLS: PBD$=SBD$
9020 GOSUB 4000
9030 PRINT @0,"--GOLF TEE PUZZLE--";
9040 GOSUB 1000:PRINT @64,PBD;" STARTING PEGS.";
9050 REM  GET ALL LEGAL MOVES
9060 PRINT @768,"POSSIBLE MOVES:";: X=0
9065 FOR J=783 TO 895: PRINT @J," ";: NEXT J:PRINT @783," ";
9070 FOR MOVE=1 TO 36
9080 GOSUB 2000
9090 IF PBD = 0 THEN GOTO 9110
9100 PRINT "(";MOVE;") ";START(MOVE);"->";FIN(MOVE);",  ";:X=X+1
9110 NEXT MOVE
9115 IF X=0 THEN GOTO 9200
9120 PRINT @896,"SELECT A MOVE";: INPUT MOVE
9122 GOSUB 2000 : REM CHECK IF USER GAVE LEGAL MOVE
9123 IF PBD=1 THEN GOTO 9130
9124 PRINT @896,"** PLEASE SELECT FROM LIST ABOVE **"
9125 FOR J=1 TO 500: NEXT J
9126 PRINT @896,"                                   "
9127 GOTO 9120
9130 GOSUB 3000:   REM  APPLY IT TO BOARD
9140 GOSUB 4300:  REM FLASH IT ON THE SCREEN
9150 GOSUB 1000:  REM HOW MANY PEGS ARE LEFT?
9155 PRINT @40,PBD;"PEGS LEFT.";
9170 GOTO 9060
9200 PRINT @768,"NO MORE POSSIBLE MOVES"
9210 GOSUB 1000 : REM COUNT THE REMAINING PEGS
9220 IF PBD=1 PRINT "CONGRATULATIONS! YOU WON" ELSE PRINT "SORRY, YOU LOST
```

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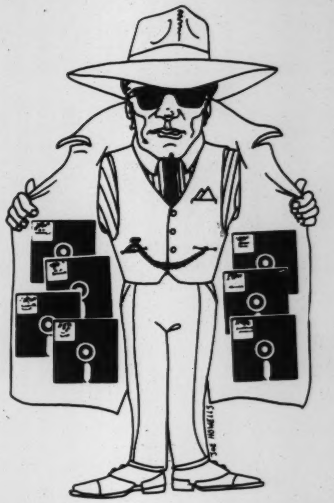

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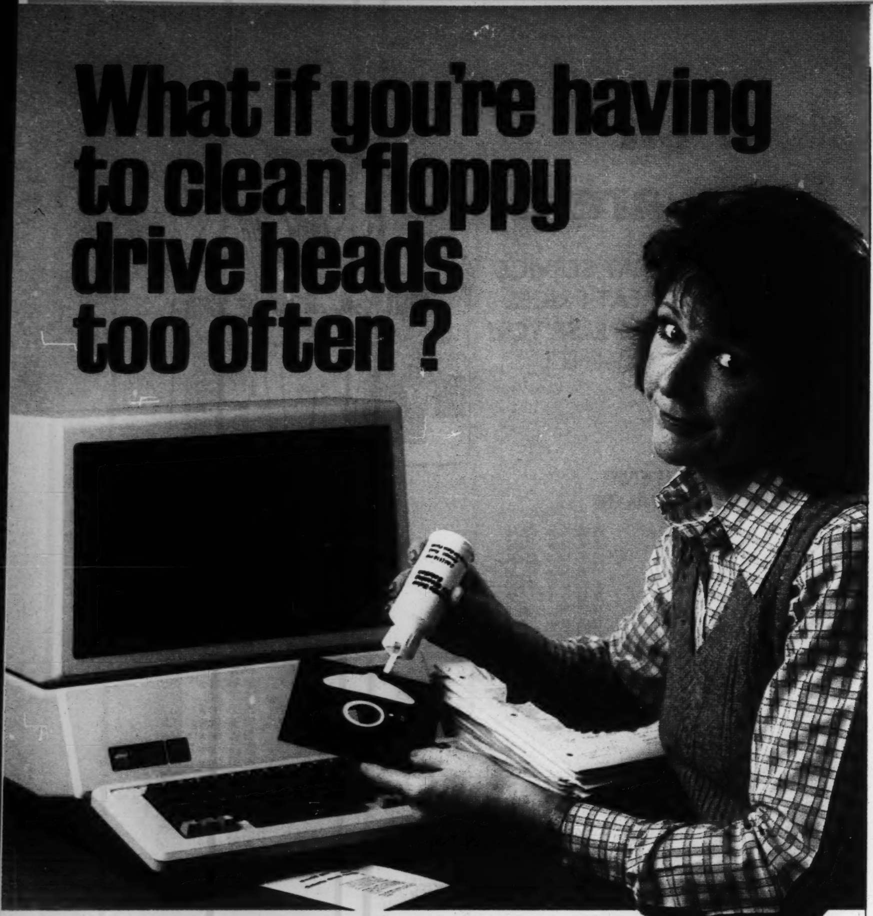
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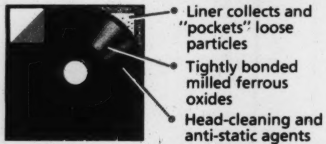
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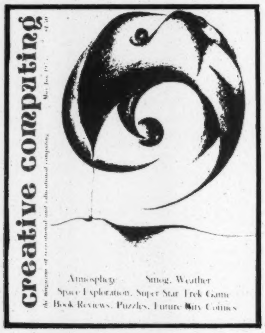
7 Years Ago in creative computing

In May 1975, the feature article by Margot Critchfield was titled "Recent Trends in Mathematics Curriculum Research." She concluded that the notion that new ideas can be packaged into infallible, teacher-proof CAI programs is ridiculous. The author recommended the use of computers in two modes—dual (student and computer program together) and solo (problem solving by the student alone using the computer as a tool).

The issue had an analysis of the first coin-op game ever—Pong—along with a short article about its designer, Nolan Bushnell. Nolan noted that he occasionally gave a surprise party, liquor and all, for the entire Atari company (which numbered 100 or so at the time).

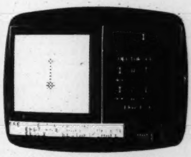
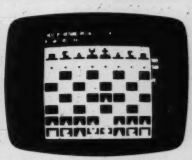
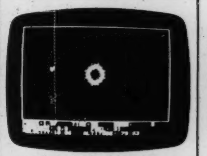
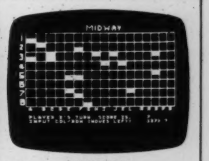
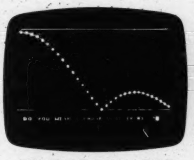
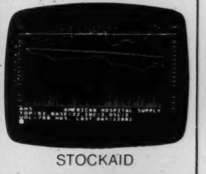
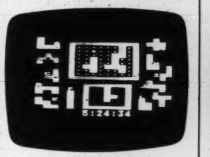
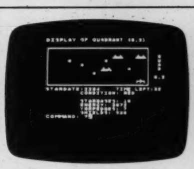
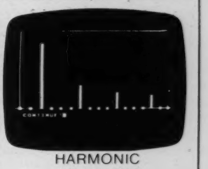
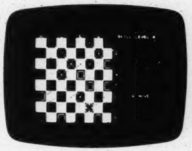
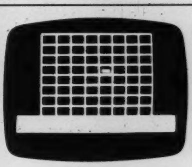
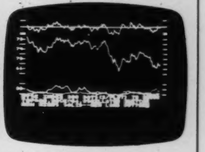
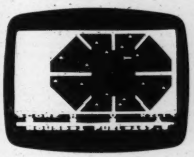
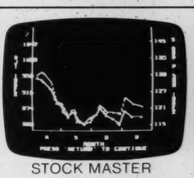
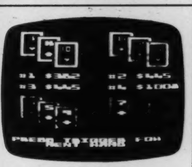
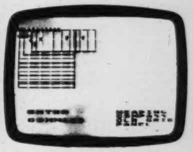
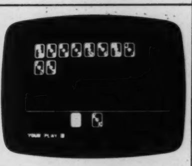
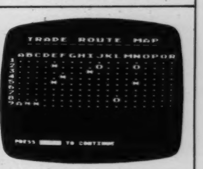
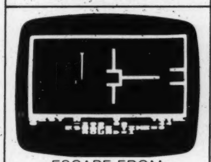
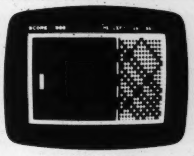
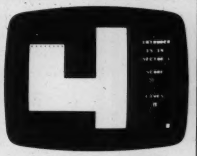
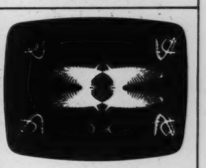

creative computing
Atmosphere
Smog, Weather
Space Exploration, Super Star Trek Game
Book Reviews, Puzzles, Future City Comics

Computer simulations occupied much of the issue. "Escape" simulated the gravitational pull of a planet (or sun) and allowed experimenting with escape velocities. An article on dynamic modelling described the now-famous Forrester World model which showed the interactions of population, natural resources, financial capital, pollution and quality of life. The projection for the year 2040 was not encouraging. Another simulation allowed the user to examine the effect automobiles have on air pollution.

The issue carried five games, among them the first published listings of Super Star Trek, Lunar Lander, and Splat (a parachute jump on the planet of your choice). Since then, all three of these games have been published in numerous other magazines, books and software packages with many subsequent publishers calling them their own. Ah, well.

In May 1975, there were no commercial microcomputers. The closest thing in the issue was an ad for the Sinclair scientific calculator which boasted that for only $49.95 it would make the slide rule obsolete. In 1975, most other scientific calculators were priced upwards of $200. □

It's hard to picture all of DYNACOMP's software

 GIN RUMMY	 SHAPE MAGICIAN	 CHESSMASTER	 BLACK HOLE	 MIDWAY
 FOURIER ANALYZER	 RINGS OF THE EMPIRE	 LEM LANDER	 STOCKAID	 HODGE PODGE
  FIRE SCANNER FOREST FIRE	 QUINTOMINOES	 STARBASE 3.2	 GO FISH	 HARMONIC ANALYZER
 CHECKERS 3.0	 HODGE PODGE	 TRIPLE BLOCKARD	 CHOMPELO	 NYINDEX
  589 * 422 1218 1218 2436 256998 TEACHER'S AIDE	 SPACE TRAP	 STOCK MASTER STOCK PLOT	 BACCARAT	 SUPER SUB CHASE
 MAIL MASTER	 VALDEZ (MAP)	 STOCK MASTER STOCK PLOT	 GIN RUMMY	 TRADE ROUTE MAP ABCDEFGHIJKLMNOPQR SPACE LANES
 ESCAPE FROM VOLANTIUM	 BREAKUP	 INTRUDER ALERT	 DYNACOMP P.F.S. DISK DIRECTORY PERSONAL FINANCE SYSTEM	 CRYSTALS

TURN TO NEXT PAGE....

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CARD GAMES

NEW **BRIDGE MASTER (Available for all computers)** Price: $21.95 Diskette

If you liked DYNACOMP'S BRIDGE 2.0, you will absolutely love BRIDGE MASTER. BRIDGE MASTER is a comprehensive bridge program designed to provide hours of challenging competition. Bidding features include the Blackwood convention, Stayman convention, pre-emptive openings, and recognition of demand bids and jump-shift responses. After playing a specific hand, you may replay the same hand, with the option of switching cards with your computer opponents. This feature allows you to compare your bidding and playing skills to BRIDGE MASTER. Bonuses for game contracts and slams are awarded as in duplicate bridge. Doubled contracts are scored based upon a computer assigned vulnerability. A score card is displayed at the conclusion of each hand. The score card displays a summary of total hands played, total points scored, number of contracts made and set, and % bids made. BRIDGE MASTER is clearly the best computer bridge program available.

DYNACOMP'S previous BRIDGE 2.0 customers may upgrade to BRIDGE MASTER for a nominal charge of $5.00 plus postage and handling (see ordering information box).

NEW **BACCARAT (Atari only)** Price $18.95 Cassette/$22.95 Diskette

This is the European card game which is the favorite of the Monte Carlo jet set. Imagine yourself at the gaming table with 007 to your left and Goldfinger to your right. Learn and play BACCARAT at your leisure on the Atari. Contains full high resolution color graphics and matching sound. Runs in 16K. Requires one joystick.

NEW **GIN RUMMY (Apple diskette only)** Price: $22.95 Diskette

This is the best micro computer implementation of GIN RUMMY existing. The computer plays exceptionally well, and the HIRES graphics are superb. What else can be said?

POKER PARTY (Available for all computers) Price: $19.95 Cassette/$23.95 Diskette

POKER PARTY is a draw poker simulation based on the book, POKER, by Oswald Jacoby. This is the most comprehensive version available for microcomputers. The party consists of yourself and six other (computer) players. Each of these players (you will get to know them) has a different personality in the form of a varying propensity to bluff or fold under pressure. Practice with POKER PARTY before going to that expensive game tonight! Apple cassette and diskette versions require a 32 K (or larger) Apple II.

NEW NEW **GO FISH (Available for all computers)** Price: $14.95 Cassette/$18.95 Diskette

GO FISH is a classic children's card game. The opponent is a friendly computer with user inputs that are simple enough for small children to easily master. The Apple and Atari versions employ high resolution graphics for the display of hands. A must for children! Runs in 16K.

NEW **BLACKJACK COACH (32K TRS-80 only)** Price: $29.95 Cassette/$33.95 Diskette

BLACKJACK COACH is both a game and an educational tool. With this program you may quantitatively test standard and special playing and betting methods, including the several card count schemes. You can simply play, play with the computer as a coach, or statistically test your method under long run automatic play. All the standard player choices are included: insurance, splitting pairs, double downs and surrender (optional). The computer analyzes the technique and provides detailed summary reports which statistically pinpoint the strengths and weaknesses of your play. Don't risk your money at the tables until you have practiced with BLACKJACK COACH!

THOUGHT PROVOKERS

NEW **MANAGEMENT SIMULATOR (Available for all computers)** Price: $25.95 Cassette
$29.95 Diskette

This program is both an excellent teaching tool as well as a stimulating intellectual game. Based upon similar games played at graduate business schools, each player or team controls a company which manufacturers three products. Each player attempts to outperform his competitors by setting selling prices, production volumes, marketing and design expenditures etc. The most successful firm is the one with the highest stock price when the simulation ends.

FLIGHT SIMULATOR (Available for all computers) Price: $19.95 Cassette/$23.95 Diskette

A realistic and extensive mathematical simulation of take-off, flight and landing. The program utilizes aerodynamic equations and the characteristics of a real airfoil. You can practice instrument approaches and navigation using radials and compass headings. The more advanced flyer can also perform loops, half-rolls and similar aerobatic maneuvers. Although this program does not employ graphics, it is exciting and very addictive. See the software review in COMPUTRONICS. Runs in 16K Atari.

VALDEZ (Available for all computers) Price: $17.95 Cassette/$21.95 Diskette

VALDEZ is a computer simulation of supertanker navigation in the Prince William Sound/Valdez Narrows region of Alaska. Included in this simulation is a realistic and extensive 256 × 256 element map, portions of which may be viewed using the ship's alphanumeric radar display. The motion of the ship itself is accurately modelled mathematically. The simulation also contains a model for the tidal patterns in the region, as well as other traffic (outgoing tankers and drifting icebergs). Chart your course from the Gulf of Alaska to Valdez Harbor! See the software reviews in 80 Software Critique and Personal Computing.

NEW **BACKGAMMON 2.0 (Available for all computers)** Price: $19.95 Cassette/$23.95 Diskette

This program tests your backgammon skills and will also improve your game. A human can compete against a computer or against another human. The computer can even play against itself. Either the human or the computer can double or generate dice rolls. Board positions can be created or saved for replay. BACKGAMMON 2.0 plays in accordance with the official rules of backgammon and is sure to provide many fascinating sessions of backgammon play.

CHESS MASTER (North Star and TRS-80 only) Price: $19.95 Cassette/$23.95 Diskette

This complete and very powerful program provides five levels of play. It includes castling, en passant captures and the promotion of pawns. Additionally, the board may be preset before the start of play, permitting the examination of "book" plays. To maximize execution speed, the program is written in assembly language (by SOFTWARE SPECIALISTS of California). Full graphics are employed in the TRS-80 version, and two widths of alphanumeric display are provided to accommodate North Star users. See review in onComputing.

FOREST FIRE! (Atari only) Price: $14.95 Cassette/$18.95 Diskette

Using excellent graphics and sound effects, this simulation puts you in the middle of a forest fire. Your job is to direct operations to put out the fire while compensating for changes in wind, weather and terrain. Not protecting valuable structures can result in startling penalties. Life-like variables are provided to make FOREST FIRE! very suspenseful and challenging. No two games have the same setting and there are 3 levels of difficulty.

BLACK HOLE (Apple only) Price: $15.95 Cassette/$19.95 Diskette

This is an exciting graphical simulation of the problems involved in closely observing a black hole with a space probe. The object is to enter and maintain, for a prescribed time, an orbit close to a small black hole. This is to be achieved without coming so near the anomaly that the tidal stress destroys the probe. Control of the craft is realistically simulated using side jets for rotation and main thrusters for acceleration. This program employs Hi-Res graphics and is educational as well as challenging.

NEW **SPACE EVACUATION! (Available for all computers)** Price: $15.95 Cassette/$19.95 Diskette

Can you colonize the galaxy and evacuate the Earth before the sun explodes? Your computer becomes the ship's computer as you explore the universe to relocate millions of people. This simulation is particularly interesting as it combines many of the exciting elements of classic space games with the mystery challenge of ADVENTURE.

MONARCH (Atari only) Price: $14.95 Cassette/$18.95 Diskette

MONARCH is a fascinating economic simulation requiring you to survive an 8-year term as your nation's leader. You determine the amount of acreage devoted to industrial and agricultural use, how much food to distribute to the populace and how much should be spent on pollution control. You will find that all decisions involve a compromise and that it is not easy to make everyone happy. Runs in 16K Atari.

CHOMPELO (Atari only) Price: $14.95 Cassette/$18.95 Diskette

CHOMPELO is really two challenging games in one. One is similar to NIM; you must bite off part of a cookie, but avoid taking the poisoned portion. The other game is the popular board game REVERSI. It fully uses the Atari's graphics capability, and is hard to beat. This package will run on a 16K system.

AVAILABILITY

DYNACOMP software is supplied with complete documentation containing clear explanations and examples. Unless otherwise specified, all programs will run within 16K program memory space (ATARI requies 24K). Except where noted, programs are available on ATARI, PET, TRS-80 (Level II), NEC and Apple (Applesoft) cassette and diskette as well as North Star single density (double density compatible) diskette. Additionally, most programs can be obtained on standard (IBM 3740 single density/double density compatible format) 8" CP/M floppy disks for systems running under MBASIC or CBASIC (for example, Altos, Xerox 820, Heath/Zenith and many others). 5¼" CP/M diskettes are available for the North Star, SuperBrain and Osborne computer systems.

DYNACOMP OFFERS THE FOLLOWING

- Widest variety
- Guaranteed quality
- Fastest delivery
- Friendly service
- Free catalog
- Toll free order phone

AND MORE...

STARBASE 3.2 (Available for all computers) Price: $13.95 Cassette/$17.95 Diskette

This is the classic space simulation, but with several new features. For example, the Croylins now shoot at the Invincible without warning while also attacking starbases in other quadrants. The Croylins also attack with both light and heavy cruisers and move when shot at! The situation is hectic when the Invincible is besieged by three heavy cruisers and a starbase S.O.S. is received! The Croylins get even! See the software reviews in A.N.A.L.O.G., 80 Software Critique and Game Merchandising.

NEW **LIL' MEN FROM MARS (Atari only)** Price: $19.95 Cassette/$23.95 Diskette

Defend yourself! The little men from Mars are out to get you if you don't get them first. This is a hilarious high resolution animated graphics (arcade) game which exercises much of the Atari's power. Requires one joystick.

SPACE TILT (Apple and Atari only) Price: $14.95 Cassette/$18.95 Diskette

Use the game paddles to tilt the plane of the TV screen to "roll" a ball into a hole in the screen. Sound simple? Not when the hole gets smaller and smaller! A built-in timer allows you to measure your skill against others in this habit-forming action game.

NEW **ESCAPE FROM VOLANTIUM (Atari only)** Price: $15.95 Cassette/$19.95 Diskette

Bring the action and excitement of an arcade into your home with ESCAPE FROM VOLANTIUM! To escape you must maneuver your space ship around obstacles and laser blast the guardian (without being eaten). If he is killed with a direct shot (not just a leg lopped off), a door opens to the outside. However, the door does not stay open indefinitely. If you fail to escape in time, the door closes and a new guardian appears. Sometimes you can smash through the door by repeatedly chipping away at it. Other times it is impervious. At the higher levels of play more obstacles and guardians appear, adding to the excitement. Uses high resolution graphics and sound. Runs in 16K.

ALPHA FIGHTER (Atari only) Price: $13.95 Cassette/$17.95 Diskette

Two excellent graphics and action programs in one! ALPHA FIGHTER requires you to destroy the alien starships passing through your sector of the galaxy. ALPHA BASE is in the path of an alien UFO invasion; let five UFO's get by and the game ends. Both games require the joystick and get progressively more difficult the higher you score! ALPHA FIGHTER will run on 16K systems.

THE RINGS OF THE EMPIRE (Atari only) Price: $14.95 Cassette/$18.95 Diskette

The empire has developed a new battle station protected by rotating rings of energy. Each time you blast through the rings and destroy the station, the empire develops a new station with more protective rings. This exciting game runs on 16K systems, employs extensive graphics and sound and can be played by one or two players.

INTRUDER ALERT (Atari only) Price: $15.95 Cassette/$19.95 Diskette

This is a fast paced graphics game which places you in the middle of the "Dreadstar" having just stolen its plans. The droids have been alerted and are directed to destroy you at all costs. You must find and enter your ship to escape with the plans. Five levels of difficulty are provided. INTRUDER ALERT requires a joystick and will run on 16K systems.

NEW **MIDWAY (Atari 32K only)** Price: $14.95 Cassette/$18.95 Diskette

MIDWAY is an exciting extension of the game of Battleship. It mixes the challenges of strategy and chance. Your opponent can be another human or the computer. Color graphics and sound are both included. Runs in 16K.

TRIPLE BLOCKADE (Atari only) Price: $14.95 Cassette/$18.95 Diskette

TRIPLE BLOCKADE is a two-to-three player graphics and sound action game. It is based on the classic video arcade game which millions have enjoyed. Using the Atari joysticks, the object is to direct your blockading line around the screen without running into your opponent(s). Although the concept is simple, the combined graphics and sound effect lead to "high anxiety".

GAMES PACK I (Available for all computers) Price: $14.95 Cassette/$18.95 Diskette

GAMES PACK I contains the classic computer games of BLACKJACK, LUNAR LANDER, CRAPS, HORSERACE, SWITCH and more. These games have been combined into one large program for ease in loading. They are individually accessed by a convenient menu. This collection is worth the price just for the DYNACOMP version of BLACKJACK.

GAMES PACK II (Available for all computers) Price: $14.95 Cassette/$18.95 Diskette

GAMES PACK II includes the games CRAZY EIGHTS, JOTTO, ACEY-DUCEY, LIFE, WUMPUS and others. As with GAMES PACK I, all the games are loaded as one program and are called from a menu. You will particularly enjoy DYNACOMP's version of CRAZY EIGHTS.

Why pay $7.95 or more per program when you can buy a DYNACOMP collection for just $10.95?

NEW **MOON PROBE (Available for all computers)** Price: $12.95 Cassette/$16.95 Diskette

This is an extremely challenging "lunar lander" program. The user must drop from orbit to land at a predetermined target on the moon's surface. You control the thrust and orientation of your craft plus direct the rate of descent and approach angle. Runs in 16K Atari.

SPACE TRAP (Atari only, 16K) Price: $14.95 Cassette/$18.95 Diskette

This galactic "shoot'em up" arcade game places you near a black hole. You control your spacecraft using the joystick and attempt to blast as many of the alien ships as possible before the black hole closes about you.

CHIRP INVADERS (PET/CBM only) Price: $14.95 Cassette/$18.95 Diskette

CHIRP INVADERS is an addictive game using action graphics. A Federation space station must be reached before the Chirps conquer the Earth. Stationary obstacles, moving meteors, and the attacking Chirps must all be avoided for a successful journey. Good luck. 40 column PET/CBM only.

NEW **SUPER SUB CHASE (Atari only)** Price: $19.95 Cassette/$23.95 Diskette

SUPER SUB CHASE simulates a search and destroy mission. Set your course and keep an eye on the sonar readings as you hunt for the hidden submarine. Set the depth charge explosion depth and watch them sink towards the sub. This is an addictive game which takes advantage of the Atari's graphics and sound capabilities. One or two players. Joystick(s) required.

ADVENTURE

CRANSTON MANOR ADVENTURE (North Star, SuperBrain and CP/M only) Price: $19.95 Diskette

At last! A comprehensive Adventure game for North Star and CP/M systems. CRANSTON MANOR ADVENTURE takes you into mysterious CRANSTON MANOR where you attempt to gather fabulous treasures. Lurking in the manor are wild animals and robots who will not give up the treasures without a fight. The number of rooms is greater and the associated descriptions are much more elaborate than the current popular series of Adventure programs, making this game the top in its class. Play can be stopped at any time and the status stored on diskette. Not available in 5¼" CP/M format.

GUMBALL RALLY ADVENTURE (North Star only, 48K) Price: $21.95 Diskette

Take part in this outlaw race from the east coast to the west coast. The goal is to find your way to the finish line while maintaining the highest possible speed. You may choose one of five cars available at the garage. The choice will affect your speed and range. Remember to take spare parts and don't get caught speeding!

UNCLE HARRY'S WILL (North Star only, 40K) Price: $24.95 Diskette

Uncle Harry has died and has left you everything. However, he has neglected to mention where everything is! Instead, his will consists of a poem which contains clues. You will have to travel all over the United States both by car and on foot to solve the puzzle, and there are over 300 locations to probe. Be careful and watch out for red herrings!

TYPE 'N' TALK

DYNACOMP is now distributing the new and revolutionary TYPE-'N-TALK™ (TNT) speech synthesizer from Votrax. Simply connect TNT to your computer's serial interface, enter text from the keyboard and hear the words spoken. TNT is the easiest-to-program speech synthesizer on the market. It uses the least amount of memory and provides the most flexible vocabulary available anywhere!

TYPE-'N'-TALK List price $375. DYNACOMP'S price $319.95 plus $5.00 for shipping and handling.

TALK TO ME (T'N'T Atari only, 24K) Price: $14.95 Cassette/$18.95 Diskette

This program presents a superb tutorial on speech synthesis using the Atari 800 and TYPE 'N TALK™. TALK TO ME will illustrate normal word generation as well as phoneme generation. The documentation includes many helpful programming tips. TALK TO ME has been demonstrated on network (CBS) TV!

OTHER T'N'T PROGRAMS: MOON PROBE. TNT, CHOMPELO. TNT

MISCELLANEOUS

CRYSTALS (Atari only) Price: $14.95 Cassette/$18.95 Diskette

A unique algorithm randomly produces fascinating graphics displays accompanied with tones which vary as the patterns are built. No two patterns are the same, and the combined effect of the sound and graphics are mesmerizing. CRYSTALS has been used in local stores to demonstrate the sound and color features of the Atari. Runs in 16K Atari.

NORTH STAR SOFTWARE EXCHANGE (NSSE) LIBRARY

DYNACOMP now distributes the 23 volume NSSE library. These diskettes each contain many programs and offer an outstanding value for the purchase price. They should be part of every North Star user's collection. Call or write DYNACOMP for details regarding the contents of the NSSE collection.

Price: $9.95 each/$8.95 each (4 or more)
The complete collection may be purchased for $159.95.

NEW **5¼" DISKETTES (soft sectored/ten sectored)** Price: $39.95/20 Diskettes

As you might imagine, DYNACOMP purchases diskettes in large quantities and at wholesale prices. We want to pass the savings along to you!

**ATARI, PET/CBM, NORTH STAR, CP/M, IBM, OSBORNE, SUPERBRAIN, NEC PC-8000 and XEROX are registered tradenames and/or trademarks.*

***Except where noted, all TRS-80 Model I software is available on cassette (only) for the TRS-80 Model III. Exceptions: VALDEZ, CRIBBAGE, GRAFIX, CHESSMASTER. TRS-80 diskettes are not supplied with either DOS or BASIC.*

****For most North Star disk-based systems.*

*****For Altair systems having Microsoft BASIC.*

******For SUPERBRAIN systems running under MBASIC or CBASIC (state which).*

BUSINESS and UTILITIES

NEW **MAILMASTER (Atari diskette only)** **Price: $39.95 Diskette**
MAILMASTER is a very versatile software package for managing and manipulating mail lists and mini data bases. Each disk can hold over 600 customer entries containing name, address, 38 letter key words and a phone number. The display is marked so that entries may be made and edited with ease. The status (e.g., disk space left, options, etc.) is shown at all times. Labels may be printed 1,2 or 3 up, and all sorting (zip code and alphabetic) is performed by a fast machine language program.

NEW **PERSONAL FINANCE SYSTEM (Available for all computers)** **Price: $39.95 Diskette**
PFS is a single diskette, menu-oriented system composed of ten different programs. Besides recording your expenses and tax deductible items, PFS will sort and summarize expenses by payee, and display information on expenditures by any of 26 user defined codes by month or by payee. PFS will even produce monthly bar graphs of your expenses by category! This powerful package requires only one disk drive, minimal memory (24K Atari, 32K North Star) and will store up to 600 records per disk (and over 1000 records per disk by making a few simple changes to the programs). You can record checks plus cash expenses so that you can finally see where your money goes and eliminate guesswork and tedious hand calculations. Contains high speed machine language sort. PFS has been demonstrated on network (CBS) TV!

FAMILY BUDGET (Apple and Atari only) **Price: $34.95 Diskette**
FAMILY BUDGET is a very convenient financial record-keeping program. You will be able to keep track of cash and credit expenditures as well as income on a daily basis. You can record tax deductible items and charitable donations. FAMILY BUDGET also provides a continuous record of all credit transactions. You can make daily cash and charge entries to any of 21 different expense accounts as well as to 5 payroll and tax accounts. Data are easily retrieved giving the user complete control over an otherwise complicated (and unorganized!) subject.

INTELINK (Atari only) **Price: $49.95 Diskette**
This software package contains a menu-driven collection of programs for facilitating efficient two-way communications through a full duplex modem (required for use). In one mode of operation you may connect to a data service (e.g., The SOURCE or MicroNet) and quickly load data such as stock quotations onto your diskette for later viewing. This greatly reduces "connect time" and thus the service charge. You may also record the complete contents of a communications session. Additionally, programs written in BASIC, FORTRAN, etc. may be built off-line using the support text editor and later "uploaded" to another computer, making the Atari a *very* smart terminal. Even Atari BASIC programs may be uploaded. Further, a command file may be built off-line and used later as controlling input for a time-share system. That is, you can set up your sequence of time-share commands and programs, and the Atari will transmit them as needed; batch processing. All this adds up to saving both connect time and your time.

NEW **PAYFIVE (Apple II plus diskette, two drives required)** **Price: $149.95**
This is an enormously flexible employee payroll system with extraordinarily good human engineering features. PAYFIVE prints checks and compiles the required federal, state and local forms for up to 148 employees. The pay methods may be hourly, salary, commission or any combination. There are multiple options for pay periods, and they also can be used in any combination. PAYFIVE includes *many* other features and comes extremely well documented with a 200 page manual. The manual may be purchased separately for $30, and that payment later applied to the software purchase.

SHOPPING LIST (Atari only) **Price: $12.95 Cassette/$16.95 Diskette**
SHOPPING LIST stores information on items you purchase at the supermarket. Before going shopping, it will remind you of all the things you might need, and then display (or optionally print) your shopping list and the total cost. Adding, deleting, changing and storing data is very easy. Runs with 16K.

NEW **TAX OPTIMIZER (Available for all computers)** **Price: $59.95 Diskette**
The TAX OPTIMIZER is an easy-to-use, menu oriented software package which provides a convenient means for analyzing various income tax strategies. The program is designed to provide a quick and easy data entry. Income tax is computed by all tax methods (regular, income averaging, maximum and alternate minimum tax). The user may immediately observe the tax effect of critical financial decisions. TAX OPTIMIZER has been thoroughly field tested in CPA offices and comes complete with the current tax tables in its data files. TAX OPTIMIZER is tax deductible!

NEW **UTIL (Apple only, 48K)** **Price: $19.95 Diskette**
UTIL is a disk-oriented utility system which permits examining and changing of the contents of DOS 3.2 and 3.3 diskettes at the bit (nibble or byte) level. With UTIL you can easily examine the contents of a diskette sector by sector, restructure the sector pointers, reallocate sectors (e.g. bad sectors may be "hidden"), and perform many other sophisticated operations. For the experienced programmer.

NEW **TURNKEY AND MENU (Atari only)** **Price: $17.95 Diskette**
TURNKEY is a utility program which allows you to create autoboot/autorun diskettes easily. Simply load and run TURNKEY, load the program diskette to be modified, and answer the questions! The TURNKEY diskette also comes with DOS 2.0 and includes another program, MENU. MENU lists the contents of your diskette alphabetically, and permits the running of any BASIC program on the diskette by typing a single key. TURNKEY and MENU provide you with the ability to run any program on your diskette by simply turning on the computer and pressing a single key.

NEW **STOCKAID (Atari only)** **Price: $29.95 Diskette**
STOCKAID provides a powerful set of tools for stock market analysis. With STOCKAID you can display point and figure charts, as well as bar charts with oscillators. You can also examine long term moving averages and on-balance volume features. STOCKAID allows you to input daily data with a single diskette storage capability of 239 days × 16 stocks. Included are stock dividend and split adjustment capabilities. A very professional package!

NEW **SHAPE MAGICIAN (Apple II, 48K, diskette only)** **Price: $29.95**
At last! An utility for painlessly creating graphics shapes for the Apple. Create, edit and save up to 30 shapes which can then be used to develop arcade games or to simply enhance your programs. Add that professional touch!

EDUCATION

HODGE PODGE (Apple 48K and Atari diskette only) **Price: $14.95 Cassette/$18.95 Diskette**
Let HODGE PODGE be your child's teacher. Pressing any key on your Apple will result in a different and intriguing "happening" related to the letter or number of the chosen key. The program's graphics, color and sound are a delight for children from ages 1½ to 7. HODGE PODGE is a non-intimidating teaching device which brings a new dimension to the use of computers in education. See the excellent reviews of this very popular program in INFOWORLD and SOFTALK.

NEW **TEACHERS' AIDE (Atari only)** **Price: $13.95 Cassette/$17.95 Diskette**
TEACHERS' AIDE consists of three basic modules contained in one program. The first module provides addition and subtraction exercises of varying levels of difficulty. The second module consists of multiplication problems in which the student may be tested both on the final answer and/or on the subtotal answers in the long hand procedure. Several levels of complexity are provided here as well. The third module consists of division problems; one particularly nice feature of the division module is that the long hand division steps can be displayed along with the remainder in order to clearly demonstrate the procedure by which the remainder is derived. Using TEACHER'S AIDE is not merely a drill, but rather a learning experience.

NEW **PHARMACOLOGY UPDATE (PET only)** **Price: $169.95 Cassette/$149.95 Diskette**
This is DYNACOMP's first educational software entry for the medical profession (more are coming!). PHARMACOLOGY UPDATE was written by a R.N. as a masters project, with the aid of a practicing pharmacologist and an electronics instructor. This package comes in two parts. The first part is a 200 page manual which is divided into 11 sections. Each of these sections provides both concise information and probing questions. The second part consists of 11 programs that are keyed to the text and which test the degree of your understanding of the text material. This package has great educational value for the beginning student as well as the professional interested in an efficient way to review and update his or her knowledge. Available on cassettes (11) or diskette.

NEW **TEACHER'S GRADEBOOK (Apple 48K dual/single drive)** **Price: $49.95 Diskette**
TEACHER'S GRADEBOOK is a *complete* password protected record-keeping system for the classroom. It supports up to nine users, and each user may have data for up to nine classes on one disk (with up to 90 students per class). Typical information which can be entered, edited and processed includes rosters, absences and grades. Summary reports may be displayed (on the screen) or printed in various ways, with automatic weighted averaging and conversion to letter grades. This system has been tested ("goof-proofed") in the class environment and is both well-written and well-documented.

ORDERING INFORMATION

All orders are processed and shipped within 48 hours. Please enclose payment with order and include the appropriate computer information. If paying by VISA or Master Card, include all numbers on card. Purchase orders accepted.

Shipping and Handling Charges
Within North America: Add $2.00
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All orders (excluding books) are sent First Class.

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Deduct 10% when ordering 3 or more programs; 20% when ordering 5 or more. Dealer discount schedules available upon request.

8" CP/M Disks
Add $2.50 to the listed diskette price for each 8" floppy disk (IBM soft sectored CP/M format). Programs run under Microsoft MBASIC or BASIC-80.

5¼" CP/M Disks
All software available on 8" CP/M disks is also available on 5¼" disks, North Star and Osborne format.

Ask for **DYNACOMP** programs at your local software dealer. Write for detailed descriptions of these and other programs from **DYNACOMP**.

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STATISTICS and ENGINEERING

DIGITAL FILTER (Available for all computers) **Price: $39.95 Cassette/$43.95 Diskette**
DIGITAL FILTER is a comprehensive data processing program which permits the user to design his own filter function or choose from a menu of filter forms. In the explicit design mode the shape of the frequency transfer function is specified by directly entering points along the desired filter curve. In the menu mode, ideal low pass, high pass and bandpass filters may be approximated to varying degrees according to the number of points used in the calculation. These filters may optionally also be smoothed with a Hanning function. In addition, multi-stage Butterworth filters may be selected. Features of DIGITAL FILTER include plotting of the data before and after filtering, as well as display of the chosen filter functions. Also included are convenient data storage, retrieval and editing procedures.

DATA SMOOTHER (Not available for Atari) **Price: $19.95 Cassette/$23.95 Diskette**
This special data smoothing program may be used to rapidly derive useful information from noisy business and engineering data which are equally spaced. The software features choice in degree and range of fit, as well as smoothed first and second derivative calculation. Also included is automatic plotting of the input data and smoothed results.

FOURIER ANALYZER (Available for all computers) **Price: $19.95 Cassette/$23.95 Diskette**
Use this program to examine the frequency spectra of limited duration signals. The program features automatic scaling and plotting of the input data and results. Practical applications include the analysis of complicated patterns in such fields as electronics, communications and business.

TFA (Transfer Function Analyzer) **Price: $19.95 Cassette/$23.95 Diskette**
This is a special software package which may be used to evaluate the transfer functions of systems such as hi-fi amplifiers and filters by examining their response to pulsed inputs. TFA is a major modification of FOURIER ANALYZER and contains an engineering-oriented decibel versus log-frequency plot as well as data editing features. Whereas FOURIER ANALYZER is designed for educational and scientific use, TFA is an engineering tool. Available for all computers.

HARMONIC ANALYZER (Available for all computers) **Price: $24.95 Cassette/$28.95 Diskette**
HARMONIC ANALYZER was designed for the spectrum analysis of repetitive waveforms. Features include data file generation, editing and storage/retrieval as well as data and spectrum plotting. One particularly unique facility is that the input data need not be equally spaced or in order. The original data is sorted and a cubic spline interpolation is used to create the data file required by the FFT algorithm.

FOURIER ANALYZER, TFA and HARMONIC ANALYZER may be purchased together for a combined price of $51.95 (three cassettes) and $63.95 (three diskettes).

REGRESSION I (Available for all computers) **Price: $19.95 Cassette/$23.95 Diskette**
REGRESSION I is a unique and exceptionally versatile one-dimensional least squares "polynomial" curve fitting program. Features include very high accuracy; an automatic degree determination option; an extensive internal library of fitting functions; data editing; automatic data, curve and residual plotting; a statistical analysis (eg: standard deviation, correlation coefficient, etc.) and much more. In addition, new fits may be tried without reentering the data. REGRESSION I is certainly the cornerstone program in any data analysis software library.

REGRESSION II (Available for all computers) **Price: $19.95 Cassette/$23.95 Diskette**
PARAFIT is designed to handle those cases in which the parameters are imbedded (possibly nonlinearly) in the fitting function. The user simply inserts the functional form, including the parameters (A(1), A(2), etc.) as one or more BASIC statement lines. Data, results and residuals may be manipulated and plotted as with REGRESSION I. Use REGRESSION I for polynomial fitting, and PARAFIT for those complicated functions.

MULTILINEAR REGRESSION (MLR) (Available for all computers) **Price: $24.95 Cassette/$28.95 Diskette**
MLR is a professional software package for analyzing data sets containing two or more linearly independent variables. Besides performing the basic regression calculation, this program also provides easy to use data entry, storage, retrieval and editing functions. In addition, the user may interrogate the solution by supplying values for the independent variables. The number of variables and data size is limited only by the available memory.

REGRESSION I, II and MULTILINEAR REGRESSION may be purchased together for $51.95 (three cassettes) or $63.95 (three diskettes).

ANOVA (Not available on Atari cassette or for PET/CBM) **Price: $39.95 Cassette/$43.95 Diskette**
In the past the ANOVA (analysis of variance) procedure has been limited to the large mainframe computers. Now DYNACOMP has brought the power of this method to small systems. For those conversant with ANOVA, the DYNACOMP software package includes the 1-way, 2-way and N-way procedures. Also provided are the Yates 2^{K-P} factorial designs. For those unfamiliar with ANOVA, do not worry. The accompanying documentation was written in a tutorial fashion (by a professor in the subject) and serves as an excellent introduction to the subject. Accompanying ANOVA is a support program for building the data base. Included are several convenient features including data editing, deleting and appending.

BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2 (Not available for Atari)
DYNACOMP is the exclusive distributor for the software keyed to the popular texts *BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2* by F. Ruckdeschel (see advertisements in BYTE magazine). These subroutines have been assembled according to chapter. Included with each collection is a menu program which selects and demonstrates each subroutine.

Volume 1
Collection #1: Chapters 2 and 3 - Data and function plotting; complex variables and functions.
Collection #2: Chapter 4 - Extended matrix and vector operations.
Collection #3: Chapters 5 and 6 - Random number generators (Poisson, Gaussian, etc.); series approximations.
Price per collection: $16.95 Cassette/$20.95 Diskette
All three collections are available for $44.95 (three cassettes) and $53.95 (three diskettes).

Volume 2
Collection #1: Chapter 1 - Linear, polynomial, multidimensional, parametric least squares.
Collection #2: Chapter 2 - Series approximation techniques (economization, inversion, reversion, shifting, etc.).
Collection #3: Chapter 3 - Functional approximations by iteration and recursion.
Collection #4: Chapter 4 - CORDIC approximations to trigonometric, hyperbolic, exponential and logarithmic functions.
Collection #5: Chapter 5 - Table interpolation, differentiation and integration (Newton, LaGrange, splines).
Collection #6: Chapter 6 - Methods for finding the real roots of functions.
Collection #7: Chapter 7 - Methods for finding the complex roots of functions.
Collection #8: Chapter 8 - Optimization by steepest descent.
Price per collection: $14.95 Cassette/$18.95 Diskette

All eight collections are available for $99.95 (eight cassettes) and $129.95 (eight diskettes).
Because the texts are a vital part of the documentation, *BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2* are available from DYNACOMP:

BASIC SCIENTIFIC SUBROUTINES, Vol 1 (319 pages): $19.95 + 75¢ postage
BASIC SCIENTIFIC SUBROUTINES, Vol 2 (790 pages): $23.95 + $1.50 postage

See reviews in KILOBAUD and Dr. Dobbs.

NEW **SOFTNET (Apple II, 48K, diskette only)** **Price: $129.95**
SOFTNET may be used to create models of liquid pipeline systems to evaluate their flow performance. Up to 150 nodes with up to 150 connecting elements may be simulated, and models may be combined to form yet larger models. If you are involved in water distribution systems, chemical fluid flow problems, building plumbing, or similar situations, this is an ideal analysis tool.

NEW **MATCHNET (TRS-80 only)** **Price: $19.95 Cassette/$23.95 Diskette**
It often takes days to iteratively optimize an L, Pi or T matching network for a particular application. Take a few minutes with MATCHNET and you will have the Q, frequency response and reflection coefficients for any of twelve matching networks. You input the source and load impedance and MATCHNET calculates the R, C, (and L) values and plots (and/or prints) the frequency response and reflection coefficients for each configuration. The reviewer of this program remembers when he use to do this by hand and loves MATCHNET!

ACTIVE CIRCUIT ANALYSIS (ACAP) (48K Apple only) **Price: $35.95 Cassette/$39.95 Diskette**
With ACAP you may analyze the response of an active or passive component circuit. The circuit may be probed at equal steps in frequency, and the resulting complex voltages at each component juncture examined; the frequency response of a filter or amplifier may be completely determined with respect to both amplitude and phase. In addition, ACAP prints a statistical analysis of the range of voltage responses which result from tolerance variations in the components. ACAP is easy to learn and use. Circuit descriptions may be saved onto cassette or diskette to be recalled at a later time for execution or editing. ACAP should be part of every circuit designer's program library.

LOGIC SIMULATOR (Apple only; 48K RAM) **Price: $35.95 Cassette/$39.95 Diskette**
Test your complicated digital logic design with respect to given set of inputs to determine how well the circuit will operate. The elements which may be simulated include multiple input AND, OR, NOR, EXOR, EXNOR and NAND gates, as well as inverters, J-K and D flip-flops, and one-shots. Inputs may be clocked in with varying clock cycle lengths/displacements and delays may be introduced to probe for glitches and race conditions. A timing diagram for any given set of nodes may be plotted using HIRES graphics. Save your breadboarding until the circuit is checked by LOGIC SIMULATOR.

NEW **NUMBERKRUNCHER (TRS-80 only)** **Price:69.95 Cassette/$73.95 Diskette**
This program is the most complete numerical analysis system available for the TRS-80. It can handle up to 255 data sets, each set having a six character name. It includes complete data editing facilities and convenient data input/output capability. The analyses available are multiple linear regression and correlation determination of residuals, data transformations and extensive graphics generation, including axis naming, and more. The supporting documentation is extremely well written and well organized, and includes appendices which describe the numerical procedures used in the program.

NEW **STATSORT (TRS-80 only)** **Price: $39.95 Cassette/$43.95 Diskette**
STATSORT consists of several menu selected programs which allow the user to create (build, edit, merge), format and print files, (machine) sort them on any field, and numerically analyze (maximum, minimum, average, variance, standard deviation) tabulated data. STATSORT is well documented and easy to use. The cassette version can also be employed to create a data type which can be read by the Radio Shack Advanced Statistical Package.

NEW **STATTEST (Not available on Atari cassette or for PET/CBM)** **Price: $19.95 Cassette/$23.95 Diskette**
This is a statistical inference package which helps you make wise decisions in the face of uncertainty. In an interactive fashion you can build and edit data files and test the differences in means, variances and proportions. STATTEST will also perform data analysis as well as do linear correlation and regression. This menu-directed statistical workhorse is rounded out with a chi-square contingency test and a (uniform and normal) random sample generator. The documentation is written by a college professor who guides you through the various tests.

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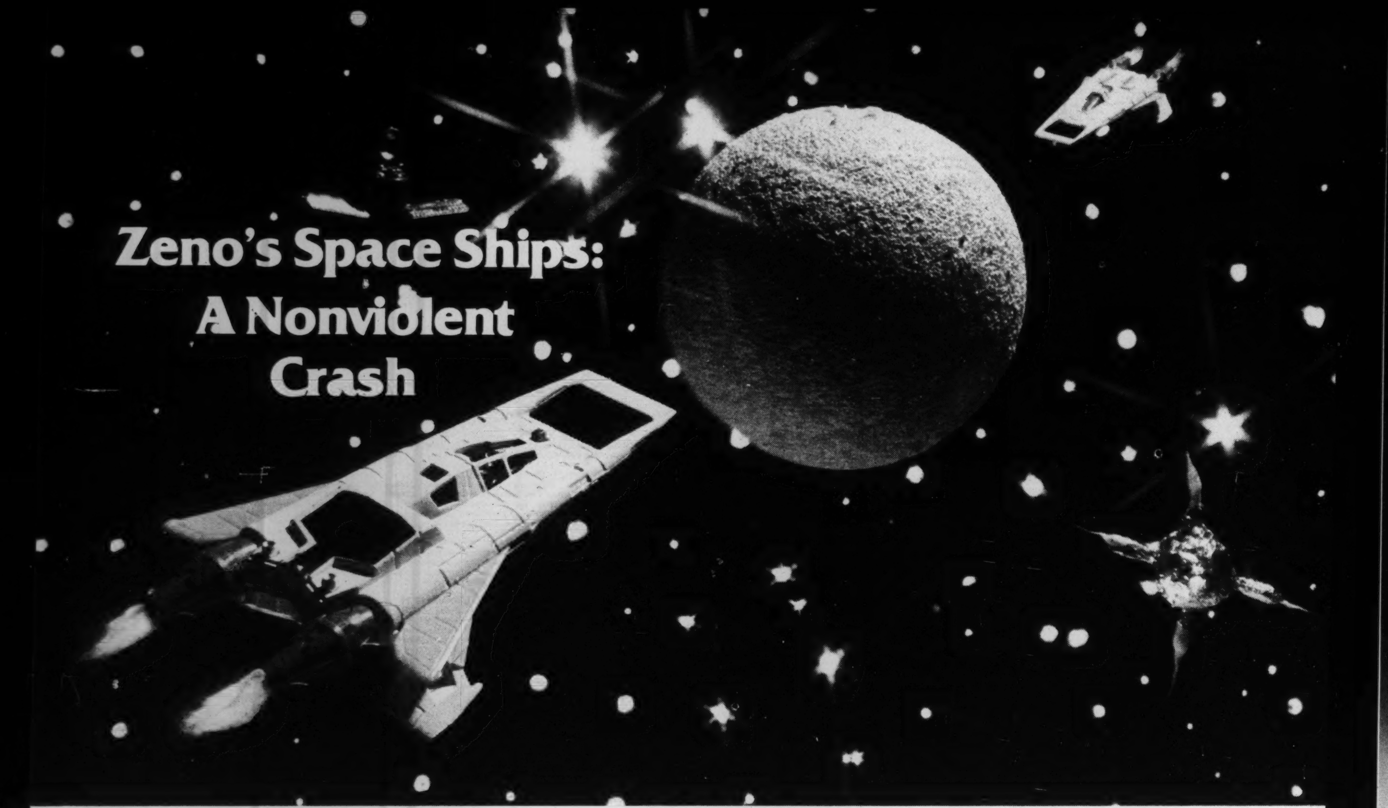


Zeno's Space Ships: A Nonviolent Crash

Michael J. Orlove

Two spacecraft are on a course for a head-on collision. They are both out of fuel but are speedily coasting toward each other on their own inertia.

They have greenhouses and farms on board and their inhabitants could go on living happily for generations if only the impending disaster could be prevented.

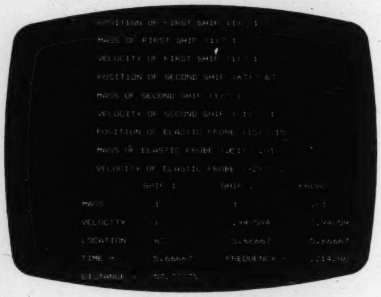
With this purpose in mind a ping-pong ball is fired from the first ship to the second. It bounces back and forth repeatedly between the ships. Every time the ball hits a ship the ship is slowed down a little and the ball is speeded up a little. What will happen?

The following program simulates this event.

One can imagine the ball bouncing between two parallel walls on the two ships, or alternatively, between two corner cubes. Thus the ball is not deflected sideways into space.

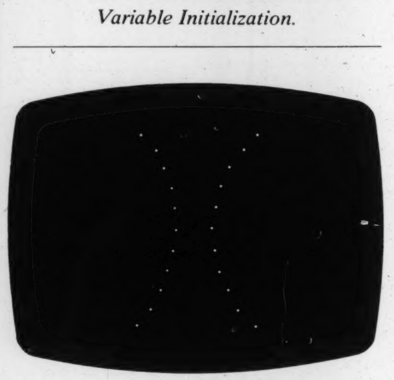
Zeno, an Ancient Greek mathematician, considered Achilles, a warrior, overtaking a tortoise in a race. His mathematical approach resembled a variable speed, slow motion camera which starts out at a reasonable speed but goes faster and faster having used an infinite length of film by the time Achilles overtakes the animal.

Zeno did the equivalent of playing this film on a constant speed projector in order to convince his poor audience that Achilles never catches up to the tortoise.



```
POSITION OF FIRST SHIP (1)? 1
MASS OF FIRST SHIP (1)? 1
VELOCITY OF FIRST SHIP (1)? 1
POSITION OF SECOND SHIP (63)? 63
MASS OF SECOND SHIP (1)? 1
VELOCITY OF SECOND SHIP (-1)? -1
POSITION OF ELASTIC PROBE (15)? 15
MASS OF ELASTIC PROBE (.01)? .01
VELOCITY OF ELASTIC PROBE (-2)? [illegible]
          SHIP 1        SHIP 2        PROBE
MASS       1             1             .01
VELOCITY   1             .94594        5.94059
LOCATION   67            5.66667       5.66667
TIME =     5.66667      FREQUENCY =    [illegible]
DISTANCE =   57.[illegible]%
```

Variable Initialization.



The program here displays one frame per ship/ball collision. Thus, when the ships are close and the ball is buzzing between them, we are in very slow motion. To keep a sensible perspective in mind, the display is a time-space graph.

Time is vertical on your screen and space is horizontal.

If you assign a mass of zero to the ping-pong ball, then an infinite number of ball/ship collisions will occur before the ship/ship collision. But this special case is indeed Zeno's case and you will wait forever for the ship/ship collision as your computer runs one frame per ship/ball collision.

For very small mass balls the simulation will not take forever but may still take a long time! But not if you use the "special feature": on request the program provides a feature which speeds the simulations.

This speed-up is accomplished by replacing the ping-pong ball you requested with a bigger, slower one. This allows the computer to plot a practically identical looking graph with fewer ball/ship collisions. The approximation is rendered best possible when the computer assigns to the substitute ping-pong ball the same initial energy as the previous one. This is done by saying: if the new ball is 1/X as fast as the old it must be X^2 times as heavy. For example a ball 1/4 as fast must be 16 times heavier and a ball 1/3 as fast

---

Michael J. Orlove, 2058 Powell Ave., Bronx, NY 10472.

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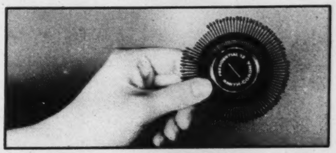

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must be 9 times heavier to have the same energy.

In conclusion, let me state that the ability to simulate continuous time as discrete events, as here, opens a can of philosophical worms. It suggests that real acceleration and deceleration may occur in steps as here.

If, however, position velocity and acceleration and all their derivatives and integrals are truly continuous, then all events past, future and distant could be known from a detailed record of one cubic meter of the universe spanning one second of history. □

```
ZENO'S SPACESHIPS
        BY MIKE ORLOVE
   CREATIVE COMPUTING VERSION"
3 PRINT"
  PARENTHESES GIVE SUGGESTED INPUTS"
10 DIM V$(63)
20 INPUT"DO YOU WANT SPEED FEATURE
   (NO)";A$
30 C4=0
40 INPUT"
AT WHAT TIME SHOULD VELOCITY STATISTICS
   FLASH ON SCREEN (1)";C
70 INPUT"POSITION OF FIRST SHIP (1)";A2
90 INPUT"MASS OF FIRST SHIP (1)";M1
110 INPUT"VELOCITY OF FIRST SHIP (1)";V1
130 INPUT"POSITION OF SECOND SHIP
    (63)";B2
150 INPUT"MASS OF SECOND SHIP (1)";M2
170 INPUT"VELOCITY OF SECOND SHIP
    (-1)";V2
190 A1=1
200 B1=1
210 Q1=1
220 INPUT"P0SITION OF ELASTIC PROBE
    (15)";Q2
240 INPUT"MASS OF ELASTIC PROBE
    (.01)";M3
260 INPUT"VELOCITY OF ELASTIC PROBE
    (-2)";V3
280 IF A$="NO"THEN 320
290 E2=M3*V3[2
300 V3=(E2/(V1*.01))[.5*(-1*ABS(V1)/V1)
310 M3=M1*.01
320 I7=0
330 I7=I7+1
340 IF B1>C THEN 680
350 GOSUB 570
400 I1=A2-A1*V1
410 I3=Q2-Q1*V3
420 C1=(I1-I3)/(V3-V1)
430 C2=V1*C1+I1
440 V4=(M1*V1+M3*V3)/(M1+M3)
450 I4=C2-C1*V4
460 V3=2*V4-V3
470 V1=2*V4-V1
480 Q2=C2
490 Q1=C1
500 A1=B1
510 A2=B2
520 B1=C1
530 B2=C2
540 Z=M1
541 M1=M2
542 M2=Z
550 Z=V1
551 V1=V2
552 V2=Z
560 GOTO 330
570 IF INT(A1)=INT(B1) THEN 670
580 IF B2<1THEN 670
590 IF B2>63 THEN 670
600 IF INT(B1)-INT(A1)=1THEN 640
610 FORJ=A1TO B1-1
620 PRINT
630 NEXTJ
640 REM
650 FORI=1TOB2
651 PRINT" ";
652 NEXTI
653 PRINT" "
660 REM
670 RETURN
680  IF C4=1 THEN 350
690 PRINT ,"SHIP 1","SHIP 2", "PROBE"
700 PRINT "MASS",M1,M2,M3
710 PRINT "VELOCITY",V1,V2,V3
720 PRINT"LOCATION",A2,B2,Q2
730 PRINT"TIME = ",B1,"FREQUENCY =
    ",1/(B1-A1)
740 PRINT "DISTANCE =",B2-A2
750 C4=1
755 INPUT "<<PRESS ENTER>>";Z$
760  GOTO 350
```

"... That's my draw?"

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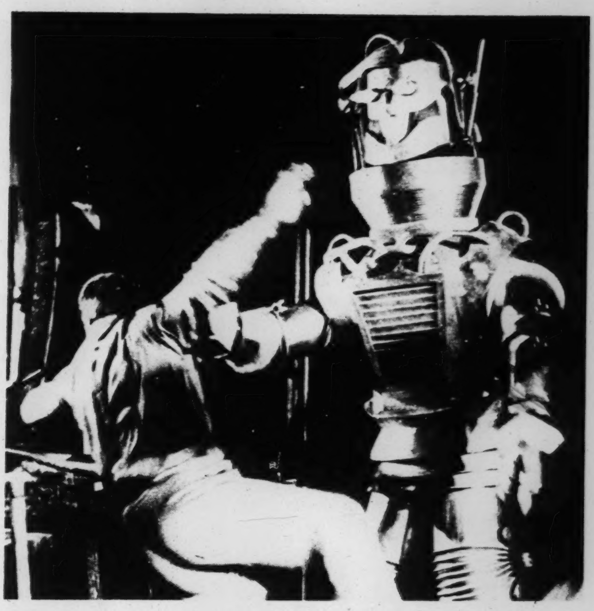
Droids: A Strategy Game for the PET

Mac Oglesby



Droids is an original educational game for up to four players. Although written for classroom use with 5th and 6th graders, it has been enjoyed by all ages.

Since Droids contains complete playing directions and because the program tolerates input errors, including null strings, it can be handed "cold" to a group with the instruction, "Here's a new game to load into the PET and learn to play."

As classroom features, besides encouraging players to develop winning strategies, Droids requires compass directions for moves instead of relying on the numeric keypad shortcut and forces players to locate little-used keyboard symbols. New users soon realize that they are not limited to one token but can move any droid.

The code for Droids consists of labelled modules:

Lines 100-180: Title.

Lines 900-930: Machine code to reverse screen at games end. These lines (along with line 5505) may be omitted.

Lines 1000-1290: Initializations. Another way to set ZZ$ equal to 40 deletes at line 1280 would be:

1280 FOR J=1 TO 40: ZZ$=ZZ$+CHR$(20):NEXT J

Lines 1300-1800: Welcome, offer instructions, get names.

Lines 2000-2600: Game loop.

Lines 5000-5210: See if game is finished.

Lines 5300-5560: Finale.

Lines 6000-6200: Display scores.

Lines 8000-8900: Print the game board.

Lines 9000-9900: Instructions.

Lines 10000-10200: Clear keyboard buffer and get one character.

Lines 11000-11630: Get player's move and check legality. ☐

Mac Oglesby, RFD 3, Putney, VT 05346.

Cursor Control Graphics for PET Listings.

▤ = Cursor Home (upper left)

◘ = Clear Screen plus Cursor Home

▣ = Cursor Down

▐ = Cursor Right

█ = Cursor Left

❐ = Cursor Up

▧ = Turn On Reverse Field

▬ = Turn Off Reverse Field

Program Listing.

```
100 REM *** DROIDS ***
110 :
120 REM BY MAC OGLESBY
130 :
140 REM COPYRIGHT 1980 BY MAC OGLESBY
150 :
160 REM LAST REVISED 11-10-80
170 :
180 :
900 REM POKE MACHINE PROGRAM INTO 2ND CASSETTE BUFFER TO BLINK SCREEN
910 FOR J=826 TO 849:READ W:POKE J,W:NEXT J
920 DATA 162,128,160,0,132,33,134,34,177,33,73,128,145,33
930 DATA 200,208,247,232,224,132,208,240,96,0
1000 REM INITIALIZATION
1090 REM DR()  LOCATION OF DROIDS
1092 REM PL$()  PLAYERS' NAMES
1094 REM DS()  DROID SYMBOLS
1096 REM DI$()  DIRECTION
1098 REM CH()  CHANGE TO LOCATION
1099 REM SC()  SCORES
1100 DIM DR(4),PL$(4),DS(4),DI$(8),CH(8)
1110 FOR J=1 TO 4:READ DS(J):NEXT J
1120 DATA 35,36,37,42
```

THE ARCADE

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Torax

by Erol Pekoz

Apple II 48K Diskette DOS 3.3 (requires paddles)

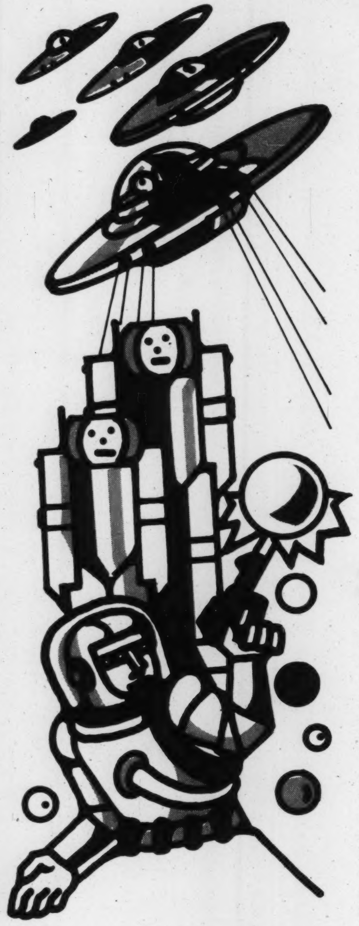
Defend your home planet against the invading Torids! Try to protect your nuclear fuel tanks, which the aliens are intent on stealing. The Torids drop down, steal a fuel tank and rise up to escape. They are also armed, and will not hesitate to shoot at you. While you whiz by the surface of your planet at incredible speed, you must avoid enemy fire, maneuver your ship, and try to shoot down the Torids without hitting the fuel tanks! **CS-4520 $24.95**

Blisterball and Mad Bomber

by Rodney McCauley

Apple II Diskette DOS 3.3 (requires paddles)

A frantic, fast paced romp that can be played for hours, *Blisterball* is the first truly original arcade-type game for a home computer. As the bouncing balls drop from above, the player moves his laser base and tries to shoot them. It's easy at first—with just one ball. Then come two, then three. It's getting harder. Four balls come, and finally five. Surviving them, the player gets to shoot at inelastic bonus balls. If he makes it this far, the second round starts. The balls bounce lower, the walls close in. Shades of Poe and Newton! Making superb use of Apple graphics and sound, *Blisterball* can be played by one or two people. *Mad Bomber*, included on the same disk, is another fast paced arcade game. Racks of bombs fill up above you. Whenever four bombs are in any rack, they start to fall. You can shoot them either in the rack or while they are falling, but since there are racks all across the top of the screen, you need to stay ahead of them to survive. **CS-4511 $24.95**



Tsunami

by Rodney McCauley

Apple II 48K Diskette DOS 3.3 (requires paddles)

Wave after wave of alien attackers attempt to overwhelm your defenses. Each wave comes in a different formation and uses different attack strategies. You get dozens of superior arcade games combined into one program. If you ever master the first set of games on the diskette, where the attackers are without shields, then you are ready for the second set. This time the attackers are sheltered by shields. They can drop bombs right through the shields but you cannot shoot through them. Successive waves use different strategies. Some move from shield to shield, allowing you to shoot while they are in between. Others just come out briefly to attack, and you must have fast reflexes to get them. Bonus points are awarded for beating the clock, with a countdown timer displayed on screen. This may be our finest arcade game ever! **CS-4526 $29.95**

Star Clones

by Matt Clark and Doug Green

Apple II or Apple II Plus, DOS 3.3 (requires game paddles)

The *Star Clones* disk includes four games. In the first game, *Clone Trooper Onslaught*, you man a laser cannon at a perimeter outpost that clones are trying to overrun. In *Attack of the Metal Monsters*, you must swoop down with your fighter and fire into the vulnerable viewport of the moving monster. In *Desert Scout Daredevil*, you must ride your land speeder across ditches containing clones bent on destroying you. In *Assault on Star Clone City*, you must navigate through a swarm of asteroids and star clone fighters to attack the enemy city. Three skill levels, 1 to 4 players. **CS-4527 $29.95**

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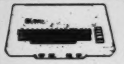
Droids, continued...

```
1200 FOR J=1 TO 8:READ DI$(J),CH(J):NEXT J
1210 DATA N,-80,NE,-78,E,2,SE,82,S,80,SW,78,W,-2,NW,-82
1250 DN$="▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓"
1260 RT$="▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓"
1270 REM
1280 ZZ$="▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓":REM 1280 ZZ$=40 DELETES
1290 REM TO CREATE LINE 1280 TYPE:        1280 ZZ$="DEL"40INST 40DEL"
1300 PRINT "▓▓▓▓▓WELCOME TO ▓▓▓▓▓D R O I D S"
1310 PRINT "▓▓▓▓▓▓▓▓WANT INSTRUCTIONS?  (Y OR N)"
1320 GOSUB 10000
1330 IF XA$="Y" THEN GOSUB 9000:GOTO 1400
1340 IF XA$<>"N" THEN PRINT "▓TYPE Y OR N, PLEASE":GOTO 1320
1400 PRINT "▓HOW MANY PLAYERS? (1 TO 4)"
1410 GOSUB 10000
1420 IF XA$<"1" OR XA$>"4" THEN PRINT "▓PLEASE TYPE 1, 2, 3, OR 4":GOTO 1410
1430 N=VAL(XA$)
1480 PRINT "▓NAMES ARE LIMITED TO 8 LETTERS.▓▓▓"
1500 FOR J=1 TO N
1505 :Z=0:PL$(J)=""
1510 :PRINT "PLAYER";J;"▓:  YOUR NAME? ";
1520 :GOSUB 10000
1530 :IF ASC(XA$)=13 THEN 1570
1532 :IF ASC(XA$)=32 THEN 1540
1535 :IF ASC(XA$)>45 AND ASC(XA$)<91 THEN 1540
1538 :PRINT:PRINT "   PLEASE REDO THIS NAME...▓":GOTO 1505
1540 :IF Z<8 THEN Z=Z+1:PRINT XA$;:PL$(J)=PL$(J)+XA$:GOTO 1520
1570 :IF Z=0 THEN PL$(J)="PLAYER"+STR$(J)
1580 :PRINT:PRINT:PRINT
1590 NEXT J
1800 GOSUB 8000:GOSUB 8600
2000 REM GAME LOOP
2100 FOR J=1 TO N
2130 :GOSUB 11000
2200 :IF PEEK(DR(D9)+CH)<>102 THEN 2400
2220 :POKE DR(D9),32:DR(D9)=DR(D9)+CH
2230 :POKE DR(D9),DS(D9)
2240 :SC(J)=SC(J)+1
2250 :GOSUB 6000
2310 :GOTO 2200
2400 :GOSUB 5000
2500 NEXT J
2600 GOTO 2100
5000 REM CHECK FOR NO MORE MOVES
5100 FOR I=1 TO 4
5110 :FOR K=1 TO 8
5120 ::IF PEEK(DR(I)+CH(K))=102 THEN I=10:K=10
5200 NEXT K,I
5210 IF I>9 THEN RETURN
5300 REM GAME OVER
5400 PRINT "▓";DN$;RT$;ZZ$;ZZ$;ZZ$
5500 PRINT "GAME OVER.  THE SCORES TELL THE WINNER."
5505 FOR J=1 TO 10:SY3 826:FOR K=1 TO 75:NEXT K,J
5510 PRINT
5520 PRINT "   PLAY AGAIN? (Y OR N)";
5530 GOSUB 10000
5540 IF XA$ ="Y" THEN RUN
5550 IF XA$="N" THEN PRINT "▓▓▓▓THANKS FOR PLAYING DROIDS.▓▓▓":END
5560 PRINT "▓":GOTO 5510
6000 REM PRINT SCORES
6100 :PRINT "▓";LEFT$(DN$,8);LEFT$(DN$,3*J);
6110 :PRINT LEFT$(RT$,32);SC(J)
6200 RETURN
8000 REM THE PLAYING FIELD
8100 PRINT "▓";
8110 PRINT "┌┬┬┬┬┬┬┬┬┬┬┬┬┬┬┐"
8120 FOR J=1 TO 9
8130 :PRINT "|▒|▒|▒|▒|▒|▒|▒|▒|▒|▒|▒|▒|▒|▒|▒|"
8140 :PRINT "├┼┼┼┼┼┼┼┼┼┼┼┼┼┼┤"
8150 NEXT J
8160 PRINT "|▒|▒|▒|▒|▒|▒|▒|▒|▒|▒|▒|▒|▒|▒|▒|"
8170 PRINT "└┴┴┴┴┴┴┴┴┴┴┴┴┴┴┘"
8200 FOR J=1 TO 4
8210 :X=32768+INT(RND(1)*800)
8220 :IF PEEK(X)<>102 THEN 8210
8230 :DR(J)=X
8240 :POKE X,DS(J)
8250 NEXT J
8500 PRINT "▓";LEFT$(RT$,32);
8510 PRINT" N▓▓▓▓▓▓NW | NE▓▓▓▓▓▓▓\|/▓▓▓▓▓▓W——┼——E▓▓▓▓▓▓▓/|\▓▓▓▓▓▓▓SW | SE▓▓▓▓▓S"
8520 RETURN
8600 PRINT;LEFT$(RT$,32);"________▓▓▓▓▓▓▓▓▓SCORES:"
8700 FOR J=1 TO N
8705 :PRINT "▓";LEFT$(DN$,7);LEFT$(DN$,3*J);
8710 :PRINT LEFT$(RT$,32);PL$(J)
8720 :GOSUB 6000
8730 NEXT J
8900 RETURN
```



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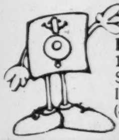

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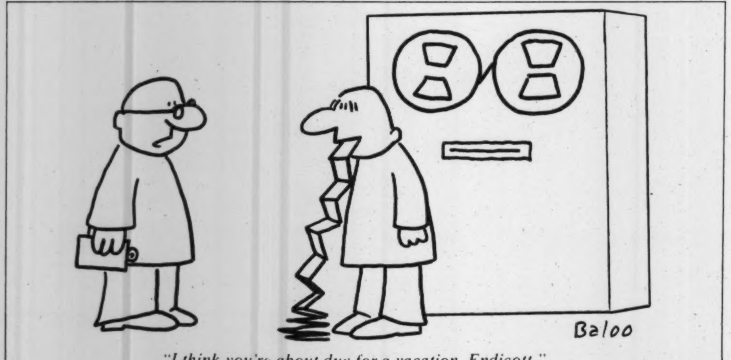
Droids, continued...

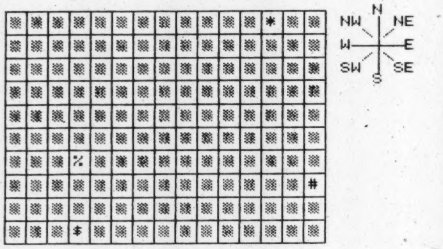
```
 9000 REM INSTRUCTIONS
 9100 PRINT "⊐";
 9110 PRINT "DROIDS ARE USED TO HUNT FOR MINERALS ON"
 9120 PRINT "▮THE PLANET MERCURY.  MINERS ON MERCURY"
 9130 PRINT "▮PLAY THIS GAME WITH FOUR DROIDS ON A"
 9140 PRINT "▮FIELD OF SQUARES, EACH CONTAINING "
 9150 PRINT "▮VALUABLE ORE (▒)."
 9160 PRINT "▮▮▮▮▮▮▮▮▮▮▮▮▮▮PRESS ▞RETURN■ TO SEE THE GAME BOARD.";
 9200 GOSUB 10000
 9210 GOSUB 8000
 9300 PRINT "▤";DN$;"⊐⊐THE DROIDS ARE #, $, %, AND *"
 9310 PRINT "▮   PRESS ▞RETURN■ TO CONTINUE...";
 9320 GOSUB 10000
 9400 PRINT "⊐GOING IN TURN, THE PLAYERS (UP TO FOUR)"
 9410 PRINT "▮MOVE ANY DROID WHICH CAN COLLECT ORE."
 9420 PRINT "▮YOU GET ONE POINT FOR EACH ▒ AND HIGH"
 9430 PRINT "▮SCORE WINS."
 9440 PRINT "▮▮▮DROIDS GO NORTH, SOUTH, EAST, WEST, OR"
 9450 PRINT "▮DIAGONALLY, BUT ONLY IN A STRAIGHT LINE"
 9460 PRINT "▮AND ONLY ONTO SQUARES WITH ORE.  ANY"
 9465 PRINT "▮PLAYER MAY MOVE ANY DROID."
 9470 PRINT "▮▮▮▮▮▮PRESS ▞RETURN■ TO CONTINUE...";
 9480 GOSUB 10000
 9500 PRINT "⊐";
 9510 GOSUB 8510
 9520 PRINT "▮▮TO MOVE A DROID, TYPE ITS SYMBOL AND"
 9530 PRINT "▮DIRECTION TO GO (N NE E SE S SW W NW)."
 9540 PRINT "▮THE DROID WILL GO THAT WAY 'TIL IT RUNS"
 9550 PRINT "▮OUT OF ORE.  FOR EXAMPLE -- "
 9560 PRINT "▮   #NE  MEANS DROID # GOES NORTHEAST."
 9600 PRINT "▮▮▮▮▮PRESS ▞RETURN■ TO START.  GOOD LUCK!!";
 9610 GOSUB 10000
 9900 RETURN
 10000 REM GET 1 CHARACTER
 10100 GET XA$:IF XA$>"" THEN 10100
 10110 GET XA$:IF XA$="" THEN 10110
 10200 RETURN
 11000 REM GET MOVE
 11100 PRINT "▤";DN$;RT$;ZZ$;ZZ$;ZZ$
 11200 PRINT PL$(J);", TYPE A DROID'S SYMBOL"
 11210 PRINT "▮  AND A DIRECTION (AND RETURN):  ";
 11300 A$=""
 11310 GOSUB 10000
 11320 IF ASC(XA$)=13 THEN 11400
 11330 IF XA$<"#" OR XA$>"W" THEN 11100
 11340 PRINT XA$;:A$=A$+XA$:IF LEN(A$)>3 THEN 11100
 11350 GOTO 11310
 11400 IF LEN(A$)<2 THEN 11100
 11410 A=ASC(LEFT$(A$,1)):D9=0
 11420 FOR K=1 TO 4
 11430 :IF A=DS(K) THEN D9=K
 11440 NEXT K
 11450 IF D9=0 THEN 11100
 11460 A$=RIGHT$(A$,LEN(A$)-1):DI=0
 11470 FOR K=1 TO 8
 11480 :IF A$=DI$(K) THEN DI=K
 11490 NEXT K
 11500 IF DI=0 THEN 11100
 11510 CH=CH(DI)
 11520 IF PEEK(DR(D9)+CH)=102 THEN RETURN
 11600 PRINT "▤";DN$;RT$;ZZ$;ZZ$;ZZ$
 11610 PRINT "SORRY, ";PL$(J);", BUT ";CHR$(DS(D9));" CAN'T GO"
 11620 PRINT "▮  THAT WAY.  TRY ANOTHER MOVE:  ";
 11630 GOTO 11300
READY.
```



"I think you're about due for a vacation, Endicott."

Sample Run

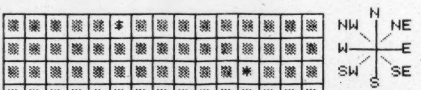
```
WELCOME TO  D R O I D S

WANT INSTRUCTIONS?  (Y OR N)

DROIDS ARE USED TO HUNT FOR MINERALS ON
THE PLANET MERCURY.  MINERS ON MERCURY
PLAY THIS GAME WITH FOUR DROIDS ON A
FIELD OF SQUARES, EACH CONTAINING
VALUABLE ORE (▒).

PRESS RETURN TO SEE THE GAME BOARD.
```



```
THE DROIDS ARE #, $, %, AND *
   PRESS RETURN TO CONTINUE...


GOING IN TURN, THE PLAYERS (UP TO FOUR)
MOVE ANY DROID WHICH CAN COLLECT ORE.
YOU GET ONE POINT FOR EACH ▒ AND HIGH
SCORE WINS.

DROIDS GO NORTH, SOUTH, EAST, WEST, OR
DIAGONALLY, BUT ONLY IN A STRAIGHT LINE
AND ONLY ONTO SQUARES WITH ORE.  ANY
PLAYER MAY MOVE ANY DROID.

PRESS RETURN TO CONTINUE...
```

N
NW
NE
W
E
SW
SE
S

```
TO MOVE A DROID, TYPE ITS SYMBOL AND
DIRECTION TO GO (N NE E SE S SW W NW).
THE DROID WILL GO THAT WAY 'TIL IT RUNS
OUT OF ORE.  FOR EXAMPLE --
   #NE  MEANS DROID # GOES NORTHEAST.

PRESS RETURN TO START.  GOOD LUCK!!
```



```
SCORES:
MARTHA
 0
CHARLIE
 0
SUZIE
 0
GEORGE
 0
MARTHA, TYPE A DROID'S SYMBOL
  AND A DIRECTION (AND RETURN):
```

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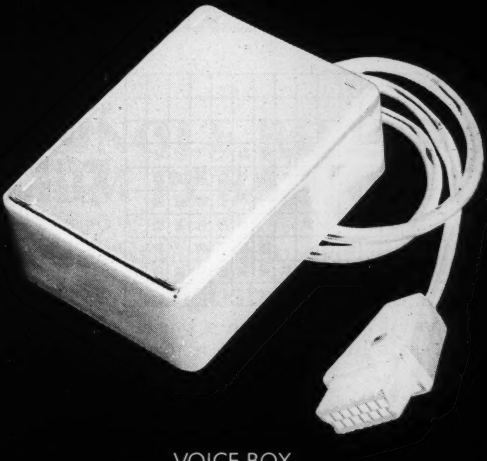

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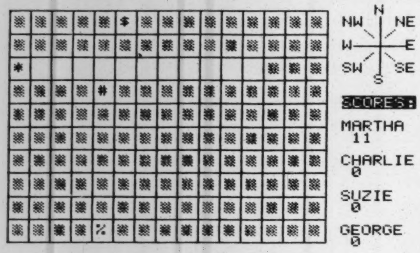
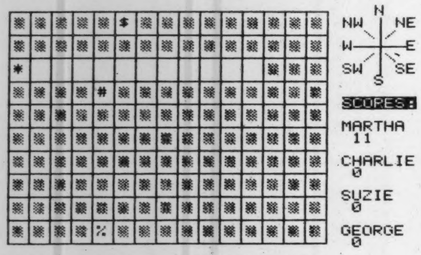

N
NW
NE
W
E
SW
SE
S

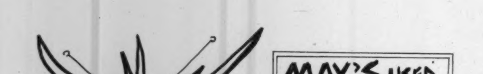
```
SCORES:
MARTHA
 11
CHARLIE
 0
SUZIE
 0
GEORGE
 0
```

```
CHARLIE, TYPE A DROID'S SYMBOL
  AND A DIRECTION (AND RETURN):
```


N
NW
NE
W
E
SW
SE
S

```
SCORES:
MARTHA
 11
CHARLIE
 0
SUZIE
 0
GEORGE
 0
```

```
CHARLIE, TYPE A DROID'S SYMBOL
  AND A DIRECTION (AND RETURN):  %NE
```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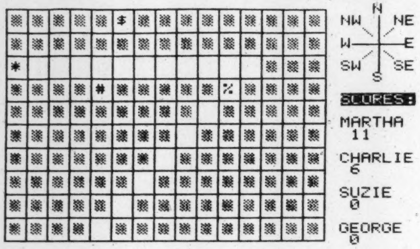
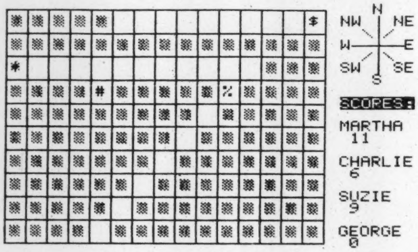
"...So..! What seems to be the problem with your new Droid, Mr. Davis?"


N
NW
NE
W
E
SW
SE
S

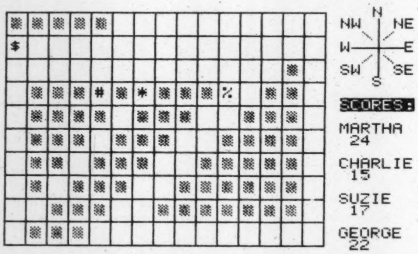
```
SCORES:
MARTHA
 11
CHARLIE
 6
SUZIE
 0
GEORGE
 0
```

```
SUZIE, TYPE A DROID'S SYMBOL
  AND A DIRECTION (AND RETURN):  $E
```


N
NW
NE
W
E
SW
SE
S

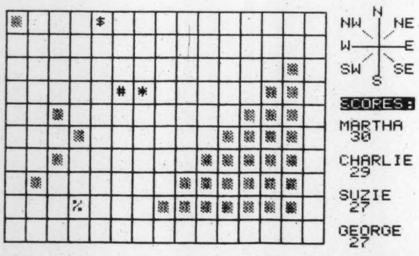
```
SCORES:
MARTHA
 11
CHARLIE
 6
SUZIE
 9
GEORGE
 0
```

```
GEORGE, TYPE A DROID'S SYMBOL
  AND A DIRECTION (AND RETURN):  $S
```


N
NW
NE
W
E
SW
SE
S

```
SCORES:
MARTHA
 24
CHARLIE
 15
SUZIE
 17
GEORGE
 22
```

```
CHARLIE, TYPE A DROID'S SYMBOL
  AND A DIRECTION (AND RETURN):
```


N
NW
NE
W
E
SW
SE
S

```
SCORES:
MARTHA
 30
CHARLIE
 29
SUZIE
 27
GEORGE
 27
```

```
GAME OVER.  THE SCORES TELL THE WINNER.
  PLAY AGAIN? (Y OR N)
```

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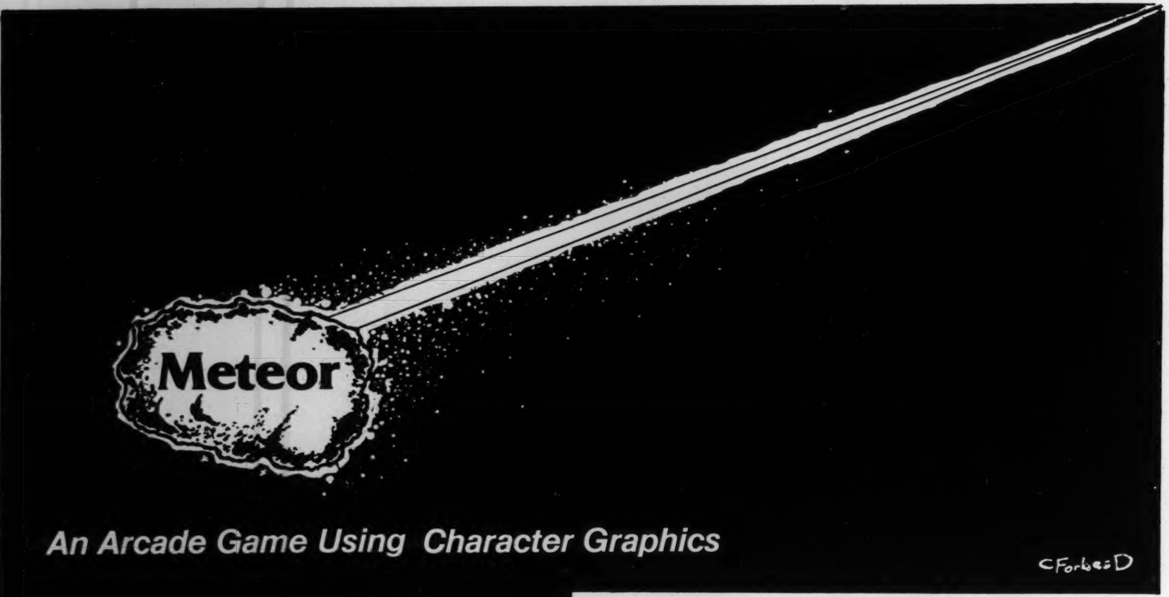

Meteor

An Arcade Game Using Character Graphics

Edward T. Ordman

Recently the university for which I work purchased several IBM Personal Computers, and I set about learning how they work. I was familiar with the Apple and TRS-80, so I wanted to check a few new features of the IBM Basic and learn my way around the keyboard and extended character set.

Since our new computers came without the Color/Graphics interface or game paddles/joysticks, a reasonable first project was to determine if an arcade-type game could be constructed using only the keyboard and character graphics on the 25-line by 80-character one-color monitor. The result was surprisingly good, and may be of interest not only to other users of the IBM Personal Computer, but to those with character rather than graphics output in general.

Real life programming jobs are seldom either bottom-up or top-down programming exclusively; one alternates as the program evolves. I started with a bottom-up approach, learning how to do a few things at a time on the new machine.

Elements of Character Graphics

First: could I place a mark wherever I wanted on the screen? Yes, and quite easily.

CLS clears the top 24 lines of the screen. It turns out that the 25th line is separate and normally displays descriptions of the ten "programmable function keys." It takes a separate command, KEY OFF, to clear the 25th line.

I decided to display the game in the top 24 lines, and use the 25th for a score display, instructions and the like.

Once the screen is clear, positioning is easy: the command LOCATE Y,X places the cursor in row Y (1 to 25) and column X (1 to 80). Notice that the Y axis is oriented downward in this notation. Now LOCATE Y,X:PRINT C$; will put the character C$ at position X of row Y.

The Basic program crashes if X or Y is out of range, so that is worth testing for, and the computer scrolls if you try to write in the bottom right-hand corner (X=80, Y=24 or Y=25) so a writing routine should protect against that.

We now have a reasonably well-developed point-placing subroutine:

```
330 REM PUT THE CHARACTER C$ AT X(OVER),
    Y(DOWN)
340 IF X<1 OR X>80 OR Y<1 OR Y>24 THEN
    RETURN
350 IF X = 80 AND Y = 24 THEN X = 79
360 LOCATE Y,X : PRINT C$;
370 RETURN
```

Of course, the tests in lines 340-350 can be eliminated if the program tests those conditions before calling the subroutine.

On my way up from the bottom, I asked: can I draw a line? Recalling my analytic geometry, here is a first draft of a way to draw a line from X1,Y1 to X2,Y2, marking each point with character C$:

```
390 REM DRAW A LINE FROM X1,Y1 TO X2,Y2. ASSUME
    Y2>Y1
400 FOR Y = Y1 to Y2
410 X = (X2-X1)/(Y2-Y1) * (Y-Y1) + X1
420 GOSUB 330
430 NEXT Y
440 RETURN
```

A quick experiment reveals that that does not work satisfactorily; X is rarely an integer. Adding 415 X = INT(X + .5) helps, but the loop is still much slower than it should be; we are doing unnecessary repeated calculations during the loop. Here is a better version:

```
390 REM DRAW A LINE FROM X1,Y1 TO X2,Y2 WITH
    Y2>Y1
400 SO = (X2-X1)/(Y2-Y1): S=X1-SO
410 FOR Y=Y1 TO Y2
420 S = S+SO : X = INT(S + .5) : GOSUB 330
430 NEXT Y
440 RETURN
```

This version makes fewer calculations inside the loop.

We could have another version of this program in case Y1=Y2, interchanging X and Y throughout, and maybe even a test for whether ABS(X1-X2) > ABS(Y1-Y2): do we want a line moving nearly horizontally to show as

```
XXX
   XXX
      XXX
```

or as

```
X
  X
    X ?
```

Since the latter will give faster motion, I settled for it. On that basis, the routine just given will plot any *descending* line.

Edward T. Ordman, Department of Mathematical Sciences, Memphis State University, Memphis, TN 38152.

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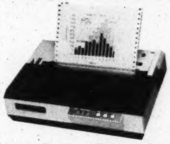

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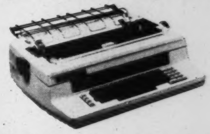

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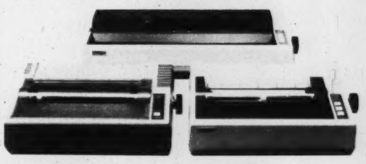

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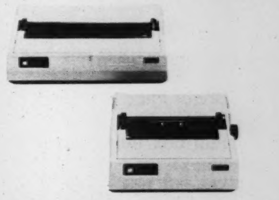

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A Note On RANDOMIZE

IBM Personal Computer Basic will produce the same sequence of random numbers each time unless you use the command RANDOMIZE. You must provide a "seed," or starting value, in the range -32767 to 32767. Of course, you would like that seed to be unpredictable, and if possible different almost every time you start. Here are two methods:

- In this game there is a keyboard input called for very early: DO YOU WANT DIRECTIONS? In the loop at lines 160-170, we repeatedly test (using INKEY$) to see if the Y, N, or Enter key has been struck. The variable R is incremented each time we go around that loop, and kept in the range 0 to 32003 by the MOD (modular arithmetic) addition. Thus the seed in RANDOMIZE R depends on how quickly the user pressed the key.
- A somewhat easier method is available in Disk Basic or Advanced Basic, since these have the keyword TIME$. One and a half minutes after the computer has been turned on, if the user has not reset it, this variable has the value "00-01-30" (No hours, one minute, thirty seconds). We can convert it to a number and use it as a seed by a command such as RANDOMIZE VAL(MID$(TIME$,7,2)+MID$(TIME$,4,2)).This will produce RANDOMIZE 3001 at the just-mentioned time after startup. While this method is certainly easier than the first method, I have included the first method in the listing since the second method is unavailable in cassette Basic.

These commands and details particular to the IBM Personal Computer are provided so that users of other microcomputers can substitute as may be required by their systems:

Table 1.

CLS	Clear Screen. This applies only to lines 1 - 24 unless KEY OFF is in effect.
KEY OFF, KEY ON	Turns off and on the line 25 display of meanings of the 10 programmable keys.
LOCATE A,B	Moves the cursor to line A (range 1-25), position B (range 1-80).
SCREEN(A,B)	Returns an integer: the number of the character presently appearing at line A, position B, on the screen.
STRING$(N,K)	Returns a character string N characters long, each character is character number K.
SOUND F,B	Sounds the speaker, frequency F, for duration B units.
INKEY$	The one or two character long character string denoting the most recently pushed key, or the empty string if no key has been pushed since it was last referenced.
RANDOMIZE N	Restart random number sequence, based on the seed N. An unpredictable N may be obtained by extracting substrings from TIME$.
TIME$	The clock time since the system was booted up, as a character string, of the form 02-25-14 for 2 hours, 25 minutes, 14 seconds. May be reset to actual time, if desired.

Screen Characters used:

2	Bright Face (1 is Dark Face)
25	Down arrow, ↓
219	Full box (all white if writing white on black)
178	Shaded box (grey, if writing white on black)

Keyboard Characters used:

13	Enter, often called carriage return. Denoted ↵ on key.
32	Space or blank
0-77	Cursor right returns a two-character string, CHR$(0)+CHR$(77)
0-75	Cursor left
0-72	Cursor up
0-80	Cursor down
0-83	DEL (Delete)
0-82	INS (Insert)

A Top-Down Approach

With those subroutines in hand. I soon had a slow shower of characters falling down my CRT screen. A game began to take shape in my mind.

Trial Program Outline (Version 1)

1. Clear screen.
2. Create a marker showing where the "player" is.
3. Periodically have objects falling from the top of the screen.
4. Give the player a way to move his marker, to dodge the falling objects.
5. Turn ends when the player's marker is hit by a falling object.

This was not entirely satisfactory. It would be far more satisfactory if there were something the player could do (other than simply survive) to score points.

Basic character graphics run a bit slowly to allow shooting sorts of games, which I don't really like very much anyway. I decided instead to try letting the player marker move through a path or obstacle course, or gather points when it got to certain targets.

Program Outline (Version 2)

1. Clear screen; position player marker.
2. Create targets on screen.
3. Choose a path for a falling "meteor."
4. Each time the meteor falls one position:
    5. If it hits the player marker, go to step 13 (end of turn).
    6. Erase old meteor position, mark new one.
    7. Does player want to move his marker? (Read keyboard) If he does:
        8. If new position is occupied, perform step 12 (score).
        9. Erase old position, mark new one.
    10. If meteor has further to fall, go to step 4.
11. Return to step 3.
12. (Score) Depending on the target hit, increment score, display score on the screen, make a noise: return to main program.
13. (Player is hit). Sound a noise. Draw explosion. Await input to decide whether to play again (go to step 1) or exit program.

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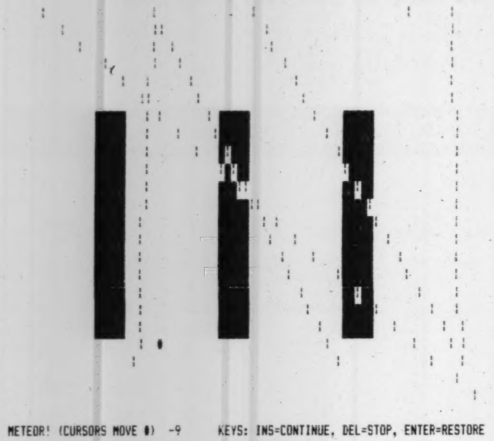
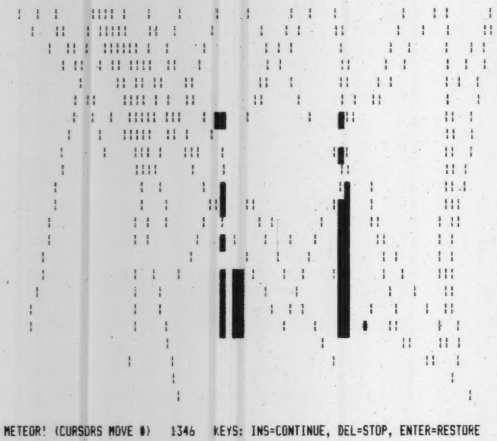
CIRCLE 153 ON READER SERVICE CARD

Here are some pictures showing the game Meteor being played. The pictures were made using an Epson MX-80 printer, which requires a somewhat different character set than is used on the CRT screen. The meteor trails are shown here as short vertical marks (¦). and the player's position is marked with a #.



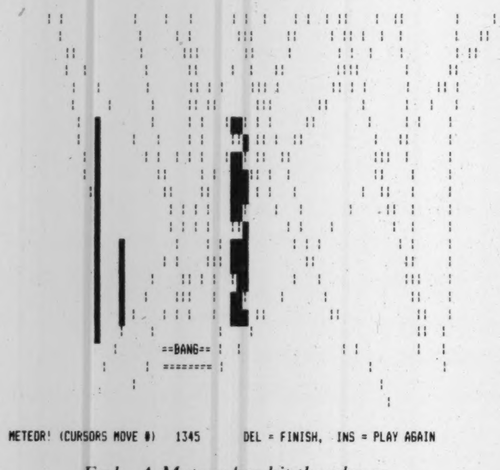
```
METEOR! (CURSORS MOVE #)  -9     KEYS: INS=CONTINUE, DEL=STOP, ENTER=RESTORE
```

Early in the game.



```
METEOR! (CURSORS MOVE #)   1346    KEYS: INS=CONTINUE, DEL=STOP, ENTER=RESTORE
```

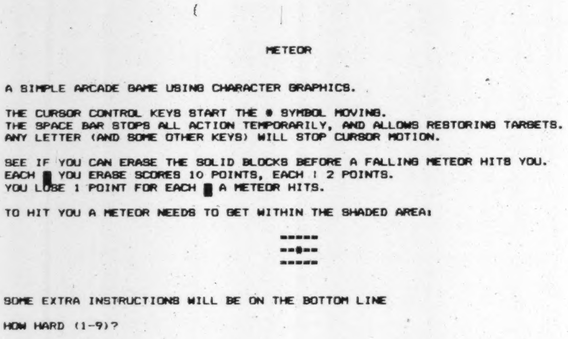
Well into the game—many of the targets have been erased.



```
==BANG==
========

METEOR! (CURSORS MOVE #)   1345        DEL = FINISH,  INS = PLAY AGAIN
```

End—A Meteor has hit the player.



```
                                  METEOR


A SIMPLE ARCADE GAME USING CHARACTER GRAPHICS.

THE CURSOR CONTROL KEYS START THE # SYMBOL MOVING.
THE SPACE BAR STOPS ALL ACTION TEMPORARILY, AND ALLOWS RESTORING TARGETS.
ANY LETTER (AND SOME OTHER KEYS) WILL STOP CURSOR MOTION.

SEE IF YOU CAN ERASE THE SOLID BLOCKS BEFORE A FALLING METEOR HITS YOU.
EACH █ YOU ERASE SCORES 10 POINTS, EACH | 2 POINTS.
YOU LOSE 1 POINT FOR EACH █ A METEOR HITS.

TO HIT YOU A METEOR NEEDS TO GET WITHIN THE SHADED AREA:

                                 =====
                                 ==#==
                                 =====


SOME EXTRA INSTRUCTIONS WILL BE ON THE BOTTOM LINE

HOW HARD (1-9)?
```

The directions as shown on the screen (symbols altered for printer).

Converting Graphics for Printer Output

I have an unmodified Epson MX-80 printer. Its graphics characters are in many ways better suited to the TRS-80 than to the IBM Personal Computer. Still, I wanted to print enough to show what the screen looked like while playing the game. Accordingly, to make the screen printouts provided with this article, I did the following:

For the characters used in the program, I substituted characters that would have a similar general visual effect on the Epson printer. This involved changing lines 120, 140, 370, 700, and 710. The substitutions I made were as follows:

For CHR$(2) (face) I used CHR$(35), that is, #.

For CHR$(219) (solid square) I used CHR$(223), the printer solid block.

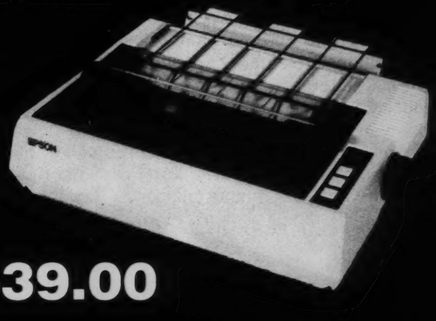
For CHR$(25) (down arrow) I used CHR$(124), the vertical line | .

For CHR$(178) (shaded square) I used CHR$(61), the equal sign =.

Then I set the printer in *compressed character* (132 characters per line) mode to make the printed shape close to the original screen shape. I ran the game, periodically using the pause-on-space-bar feature of the game to halt the action, and print out the screen using the built-in Print Screen key.

PERSONAL COMPUTERS PERSONAL COMPUTERS PERSONAL COMPUTERS

EPSON MX-80



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CIRCLE 206 ON READER SERVICE CARD

Built-In Machine Functions

It is now clear that we need to know at least two more functions: how to find out what is displayed at a point on the screen, and how to detect keyboard input without waiting for an INPUT statement.

The first function is easy: SCREEN(Y,X) is a built-in numeric function which returns the number of the character present on the screen in position X of line Y. (In some versions of Basic, on other computers, this may take a PEEK or other technique. In extreme cases—a computer talking to a very dumb terminal—it may require keeping a copy of the screen in an array in memory.)

The second is also easy: INKEY$ is a reserved word whose value is the key recently pressed. There is a slight complication, however: on the IBM Personal Computer, some keys produce a two-character value for INKEY$. For example, the Home button produces CHR$(0)+CHR$(71) for INKEY$.

From here on, it is largely a matter of picking specific characters for attractive graphics, fine tuning, and "dressing up" the game. The IBM Personal Computer provides a nice range of graphics symbols, including two small faces, one of which I selected for the player marker, and a downward arrow which was ideal for a falling meteor.

To create more scoring activity, I deducted a point when a meteor hit a target, and left meteor trails on the screen, awarding points when the player erases them. I put in a pause feature controlled by the space bar and a provision for restoring the targets when they were all erased.

Survey of the Code

A listing of the program is provided in Listing 1. Since the code, including directions and remarks, is under 100 lines, it should be easy to alter. The relatively modular design makes it easy to change into games having little superficial resemblance to the one shown here. For example, changing lines 840-900 would rearrange the targets; an alteration in lines 280-310 or 390-430 could change the character of motion of the attackers or meteors. It would be quite easy to install obstacles, that is, points through which the player marker, meteors, or both could not pass; testing that the player marker is not hitting such an obstacle would go in at around lines 700-720.

"Might as well cancel your ad; today, all the pirating is done electronically."

A description of the code, with references to the Program Outline (Version 2) above, follows:

Line 120 clears the screen and initializes.

Line 150 offers directions. If wanted, GOSUB 930.

Line 180 randomizes. IBM Basic requires a seed; see box for discussion.

Line 190 asks how hard it should be (move targets up or down screen). Note: Hitting Enter alone causes defaults: no directions, difficulty = 5.

Line 230 chooses starting location HX,HY for the player marker.

Line 240 clears the screen (step 1 of outline).

Line 250 places instructions in the bottom line.

Line 260 uses GOSUB 840 to place targets on the screen (step 2).

Lines 270-320 choose a path for the falling meteor (step 3, 11); GOSUB 390 to actually plot the line.

Line 330 (subroutine) plots a point for the meteor; checks for player marker hit and for keyboard input. If H$ is not null, but K$ is, continue player marker motion as before (step 5-6-7).

Line 390 (subroutine) draws a line for the falling meteor. If the meteor is below the player marker and cannot hit it, terminate line (step 4).

In line 450, the player is hit by a meteor. The program waits for the player to hit the INS(ert) key to restart, or the DEL(ete) key to exit (step 13).

Lines 570-730 process requests for player marker movement (step 8-9).

Line 740 increments score (step 12).

Line 760 processes pauses resulting from depression of space bar. It offers choices of continuing, exiting program, restoring targets.

Line 840 prints targets and places player marker on screen.

Line 930 gives directions. ☐

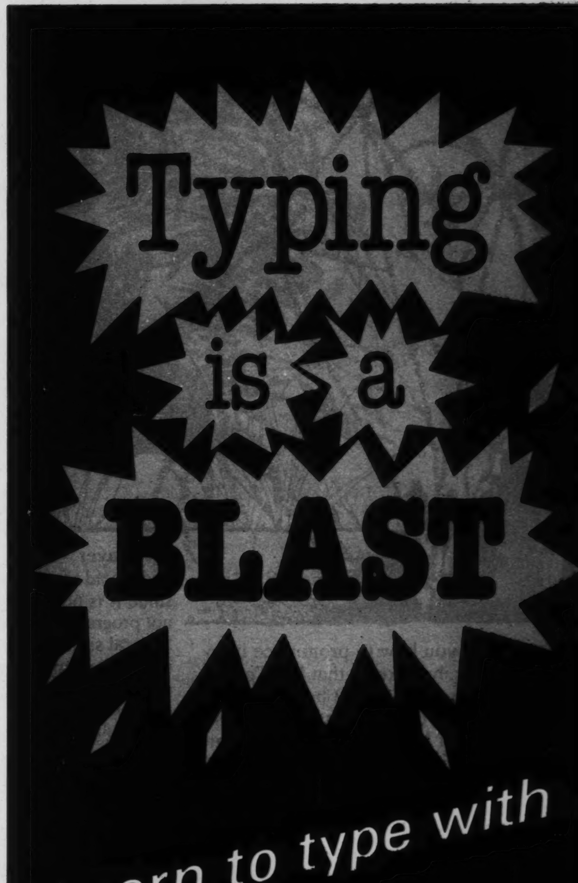
Two Minor Nuisances

I encountered two minor nuisances that I would regard as slight criticisms of the hardware and software design for the IBM Personal Computer.

- The cursor control keys double as the numeric keypad; the Numeric Lock switch alters their function. If you accidentally strike this key during repeated use of this keypad, strange things happen. In the case of this game, when you are striking cursor control keys repeatedly, hitting Numeric Lock freezes the player marker on the board and inhibits response to the cursor control keys. (This could be overcome in the game design).
- When debugging, I frequently LIST a program and stop the scrolling to read a portion of the listing; scrolling is stopped on the IBM Personal Computer by Control-Numeric Lock. Unfortunately, this can freeze the screen *in the middle* of a single scroll, causing one line of the screen (the one being rewritten) to contain false information about the program contents. (The screen will regenerate, correcting the error, if you try to exit the listing to fix the error.)

Listing 1.

```
100 REM  METEOR, A CHARACTER GRAPHICS ARCADE GAME
110 REM  BY EDWARD T. ORDMAN      NOVEMBER 1981
120 M$=CHR$(2):C$=CHR$(219):X$=CHR$(25):REM FACE,SOLID SQUARE,DOWN ARROW
130 C5$=C$+C$+C$+C$+C$:H$="":T=0:REM BLOCK,LATCH FOR FACE MOTION,SCORE
140 Y=178:E2$=STRING$(2.Y):E5$=STRING$(5,Y):E8$=STRING$(8,Y):REM SHADING
150 CLS:KEY OFF:PRINT "DO YOU WANT DIRECTIONS (Y/N)?":R=523:REM RANDOM SEED
160 R$=INKEY$:IF R$="Y" THEN GOSUB 930:GOTO 180
170 IF R$="N" OR R$=CHR$(13) THEN 180 ELSE R=(R+511)MOD 32003:GOTO 160
180 RANDOMIZE R:REM SEED BASED ON DELAY IN ANSWERING QUESTION
190 PRINT "HOW HARD (1-9)?";
200 R$=INKEY$:C=ASC(R$+" "):IF C>48 AND C<58 THEN C=C-48:GOTO 230
210 IF C=13 THEN C=5 ELSE 200
230 HX=20+INT(40*RND+1):HY=16+INT(8*RND+1):REM POSITION FOR FACE
240 CLS:LOCATE 25,1:PRINT "METEOR! (CURSORS MOVE ";M$;")";
260 GOSUB 840 :REM PUT TARGETS,PLAYER MARKER
280 Y1=1:Y2=24  :REM DESCRIBE METEOR PATH
290 X1=INT(RND*80+1):X2=INT(RND*80+1):REM EACH IS INTEGER 1-80
310 GOSUB 390:GOTO 290:REM PLOT METEOR PATH, REPEAT
330 REM PLOT X$ AT Y,X CHECKING FOR SCORES, FACE MOTION
340 K$=INKEY$:IF K$<>"" THEN H$=K$:REM H$ IS LATCH
350 IF LEN(H$)>0 THEN GOSUB 570 :REM KEY WAS STRUCK
360 IF ABS(X-HX)<3 AND ABS(Y-HY)<2 THEN 450 :REM FACE HIT
370 IF SCREEN(Y,X)=219 THEN C2=-1:SOUND 660,2:GOSUB 740:REM TARGET HIT
375 IF Y=24 AND X=80 THEN X=79 :REM WRITING 24,80 CAUSES SCROLLING
380 LOCATE Y,X :PRINT X$;:RETURN
390 REM DRAW A LINE FROM  X1,Y1 TO X2,Y2
400 S0=(X2-X1)/(Y2-Y1):S=X1-S0
410 FOR Y=Y1 TO Y2: S=S+S0: X=INT(.5+S)
420 IF Y>HY+1 THEN RETURN:REM GIVE UP IF BELOW TARGET
430 GOSUB 330:NEXT Y :RETURN
450 REM  TARGET IS HIT, POSITION MESSAGE
460 HX=HX-4:IF HX>72 THEN HX=72
470 IF HX<1 THEN HX=1
480 IF HY=24 THEN HY=23
500 SOUND 400,8:LOCATE HY,HX:PRINT E2$+"BANG"+E2$;:LOCATE HY+1,HX:PRINT E8$;
520 LOCATE 25,35:PRINT "    DEL = FINISH.  INS = PLAY AGAIN          ";
530 H$=INKEY$:IF H$=CHR$(0)+CHR$(83) THEN CLS:KEY ON:END
540 IF H$=CHR$(0)+CHR$(83) THEN CLS:KEY ON:END
550 IF H$=CHR$(0)+CHR$(82) THEN CLS: RUN
560 GOTO 530
570 REM PROCESS KEYBOARD REQUEST
580 IF H$=CHR$(32) THEN 760:REM PAUSE ON SPACE BAR
590 IF LEN(H$)=1 THEN H$="":RETURN
600 HH=ASC(RIGHT$(H$,1)):K$=H$:H$="":LOCATE HY.HX:PRINT " ";
630 IF HH=77 THEN HX=HX+1:H$=K$:IF HX>80 THEN HX=1
650 IF HH=75 THEN HX=HX-1:H$=K$:IF HX<1 THEN HX=80
670 IF HH=80 AND HY<24 THEN HY=HY+1:H$=K$
680 IF HH=72 AND HY>1 THEN HY=HY-1:H$=K$
690 IF HX=80 AND HY=24 THEN HY=23
700 IF SCREEN(HY,HX)=219 THEN SOUND 440,1:C2=10:GOSUB 740
710 IF SCREEN(HY,HX)=25 THEN SOUND 420,1:C2=2:GOSUB 740
720 LOCATE HY,HX:PRINT M$;:RETURN
740 T=T+C2:LOCATE 25,27:PRINT T;:RETURN:REM SCORE POINTS
760 LOCATE 25,35:PRINT "KEYS: INS=CONTINUE, DEL=STOP, ENTER=RESTORE  ";
770 H$=INKEY$:IF H$=CHR$(0)+CHR$(82) THEN 910
790 IF H$=CHR$(13) THEN 840
800 IF H$=CHR$(0)+CHR$(83) THEN CLS:KEY ON:END
810 GOTO 770
840 REM  PUT TARGETS AND FACE ON SCREEN
860 FOR I=12-C TO 24-C
870 LOCATE I,15:PRINT C5$;:LOCATE I.35:PRINT C5$;:LOCATE I,55:PRINT C5$;
900 NEXT I:LOCATE HY,HX:PRINT M$;
910 LOCATE 25,35:PRINT "     HIT SPACE BAR TO PAUSE                   ";
920 RETURN
930 REM  DIRECTIONS
940 CLS:PRINT:PRINT TAB(35);"METEOR":PRINT:PRINT
950 PRINT "A SIMPLE ARCADE GAME USING CHARACTER GRAPHICS."
960 PRINT :PRINT "THE CURSOR CONTROL KEYS START THE ";M$;" SYMBOL MOVING."
970 PRINT "THE SPACE BAR STOPS ALL ACTION TEMPORARILY, AND ALLOWS ";
975 PRINT "RESTORING TARGETS."
980 PRINT "ANY LETTER (AND SOME OTHER KEYS) WILL STOP CURSOR MOTION."
990 PRINT:PRINT "SEE IF YOU CAN ERASE THE SOLID BLOCKS BEFORE A FALLING ";
995 PRINT "METEOR HITS YOU."
1000 PRINT "EACH ";C$;" YOU ERASE SCORES 10 POINTS, EACH ";X$;" 2 POINTS."
1010 PRINT "YOU LOSE 1 POINT FOR EACH ";C$;" A METEOR HITS."
1020 PRINT:PRINT "TO HIT YOU A METEOR NEEDS TO GET WITHIN THE SHADED AREA:"
1030 PRINT:PRINT TAB(37);E5$:PRINT TAB(37):E2$+M$+E2$
1050 PRINT TAB(37);E5$:PRINT:PRINT
1060 PRINT "SOME EXTRA INSTRUCTIONS WILL BE ON THE BOTTOM LINE":PRINT:RETURN
```



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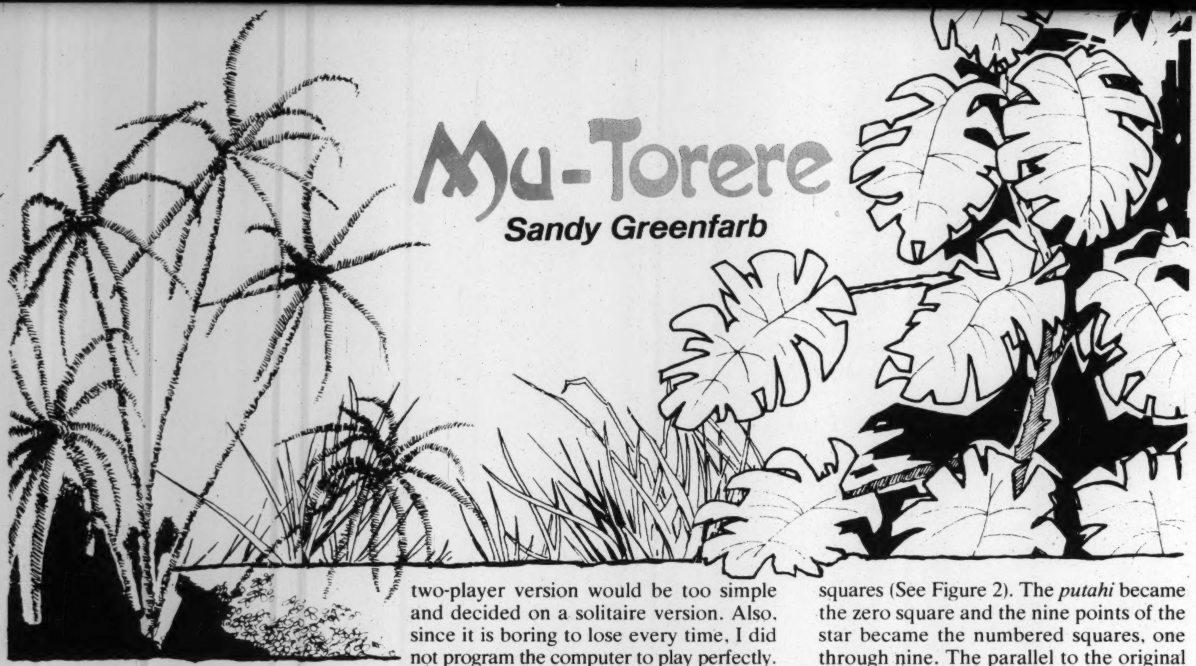


Mu-Torere

Sandy Greenfarb

I can't tell you how to pronounce it or what it means, but I know that Mu-Torere was played as late as 1912 by the Ngati-Porou tribe of the Maoris of the East Cape district of New Zealand. How's that for exotic origin! There appears to be some mystery about it. The fact that it was limited to one small corner of New Zealand suggests that it can't have been there very long, and that it must have been introduced by Europeans or by Polynesian seafarers. However, (according to an article in *Datalink*) no one has traced the game anywhere else.

The layout for Mu-Torere is a nine-pointed star (See Figure 1). The center circle is known as the *putahi*. The first player has four white stones which are initially placed at the ends of four adjacent arms of the star. The second player places four black stones at the ends of four adjacent arms. Players take alternate moves, playing one stone per move.

At any point in the game, there are three possible types of move:

1. Move sideways to the next arm if that point is vacant.
2. Move into the *putahi* if it is empty.
3. Move from the *putahi* to any unoccupied arm.

The game is won when an opponent is so placed that it is impossible to move any pieces. Despite the apparent simplicity, the game has a degree of subtlety that requires thinking ahead several moves in order to force the opponent into an unplayable position. One virtue of the game is its utter simplicity to create. It can be drawn on paper, sand, or almost anywhere.

Due to the ease of setup, I felt that a two-player version would be too simple and decided on a solitaire version. Also, since it is boring to lose every time, I did not program the computer to play perfectly. Several situational strategies are built into the program. The program will also recognize one-move forced wins and avoid certain forced-loss situations. If none of the specific strategies applies, the program will select an arbitrary move, in some cases good and in others bad. In other words, it plays like most humans.

In order to keep the program adaptable for most micros, the star was converted to a linear arrangement of numbered squares (See Figure 2). The *putahi* became the zero square and the nine points of the star became the numbered squares, one through nine. The parallel to the original rules follows:

1. Move sideways to the next adjacent number if vacant. (One should be considered adjacent to two and nine.)
2. Any number can move into zero, the *putahi*, if it is empty.
3. Zero can move into any unoccupied number.

The human plays "X" and the computer plays "O." You have the choice of moving first or second. Good luck.

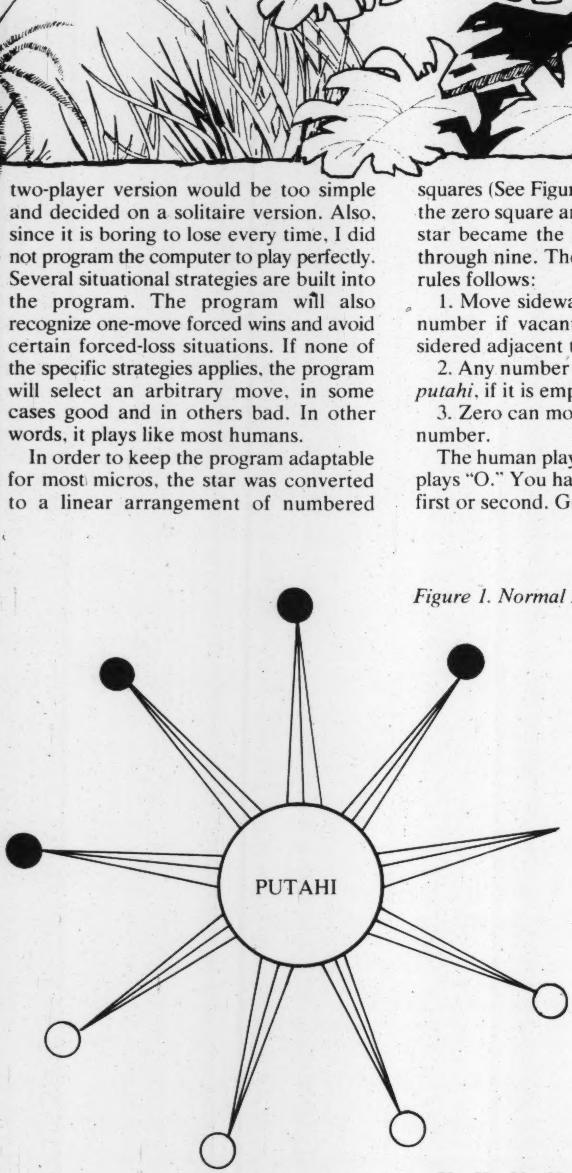
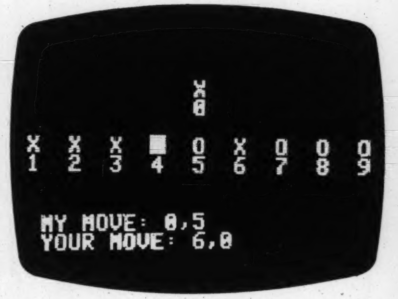


Figure 1. Normal Mu-Torere setup.

```
        ■
        0
X X X X ■ 0 0 0 0
1 2 3 4 5 6 7 8 9
```

Figure 2. Video screen setup for Mu-Torere.

Sandy Greenfarb, 3545A Thorson Ct., Ft. Meade, MD 20755.



```
            X
            0

X  X  X  ■  O  X  O  O  O
1  2  3  4  5  6  7  8  9

 MY MOVE: 0,5
 YOUR MOVE: 6,0
```

```
0  REM MU-TORERE
10  DEF  FN P(X) = X - 9 * (X > 9): REM TO KEEP 9 ADJACENT TO 1
20  DEF  FN A(X) = A( FN P(X)): REM TO HANDLE SUBSCRIPTING ON THE WRAP-AROU
    ND
30  DEF  FN R(X) =  INT (1 + X *  RND (1)): REM GENERATE RANDOM INTEGERS 1
    TO X
40  GOTO 9000
999  REM *********************
999  REM PLAYER'S MOVE
999  REM *********************
1000  PRINT "YOUR MOVE: ";
1010  GET A$: PRINT A$;",";:X =  VAL (A$): GET A$: PRINT A$:Y =  VAL (A$)
1020  IF A(X) <  > 1 OR A(Y) <  > 0 THEN 1040: REM CHECK MOVE VALIDITY
1030  IF X = 0 OR Y = 0 OR  ABS (X - Y) = 1 OR  ABS (X - Y) = 8 THEN 1050
1040  PRINT "INVALID MOVE, TRY AGAIN: ";: GOTO 1010
1050 A(X) = 0:A(Y) = 1: REM ACCEPT & RECORD MOVE
1060  GOSUB 8000
1070 P = 1: GOSUB 7000:P =  - 1: REM CHECK FOR WIN & SWITCH PLAYERS
1080  GOSUB 2000: REM APPLE'S MOVE
1090 A(X) = 0:A(Y) =  - 1: REM ACCEPT THE MOVE
1100  FOR I = 1 TO 1000: NEXT : GOSUB 8000: HOME : GOSUB 7000: PRINT "MY MO
     VE: ";X;",";Y
```

Program Notes

This program was written in Applesoft, a fairly standard Basic on the Apple II. Using "The Basic Language" as described in *More Basic Computer Games* by David Ahl, I will attempt to explain all deviations in order to simplify conversion to other micros.

DIM: Applesoft defines a 0 element with its DIM statements. It is extensively used in this program.

HTAB: Horizontal tab. TAB should suffice in most other Basics.

HOME: Applesoft version of a "Clear screen" command.

GET: Similar to TRS-80 INKEY$. Allows input of a single character as soon as key is pressed with no need to press ENTER or RETURN or whatever.

TEXT: An Applesoft mode change/housekeeping command. Can ignore on other micros.

INVERSE & NORMAL: Print modes. Ignore on other micros.

NEXT: If your micro does not recognize "NEXT" without a variable, change all occurrences to "NEXT I."

POKE 34,12 (in line 9140): Sets a "window" on the Apple II and keeps the game board from scrolling. For other micros, VTAB the PRINT statements as deemed appropriate.

CHR$(7): Sounds a beep to denote end of game.

(X>9): In line 10 is a logic condition returning a value of 0 for false and 1 for true. An alternative statement for line 10 DEF FNP(X)=X-9*INT(X/9).

POP: Causes one return address to "pop" off the top of return addresses. The next RETURN encountered after a POP causes a branch to the statement beyond the "SECOND" most recently executed GOSUB. Unfortunately this is intrinsically tied into the logic in that wherever and at what level the Apple's next move is determined, an exit is made from all move-determination decision logic. ☐

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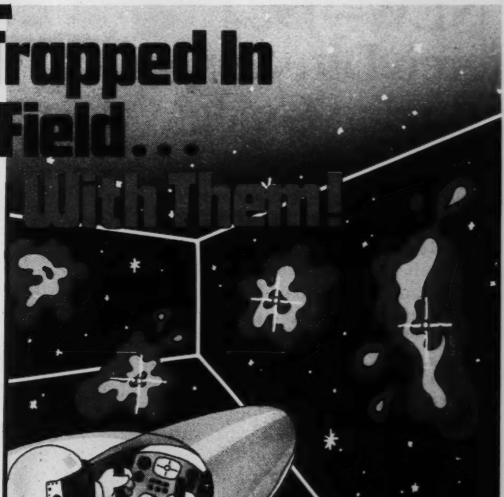

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Mu-Torere, continued...

```
1110  GOTO 1000
1999  REM ********************
1999  REM APPLE'S MOVE
1999  REM ********************
1999  REM APPLE APPLIES DIFFERING STRATEGIES BASED ON PATTERNS.
1999  REM OO.X -> O.OX ALWAYS
2000  IF H(1) <  > 0 THEN H = H(1): GOSUB 6000
2010 H = H(2): GOSUB 6000
2020  ON (A(0) + 2) GOTO 5000,3000,4000: REM NOW LOGIC VARIES DEPENDING ON
     CONTENTS OF 0.
2999  REM ***************
2999  REM IF 0 SQUARE IS EMPTY
2999  REM ***************
2999  REM OO.O -> O..O WITH O TO 0 (A WIN!)
3000  IF  FN A(H(2) + 8) <  >  - 1 OR  FN A(H(2) + 1) <  >  - 1 THEN 3030
3010  IF  FN A(H(2) + 7) =  - 1 THEN X =  FN P(H(2) + 8):Y = 0: RETURN
3020  IF  FN A(H(2) + 2) =  - 1 THEN X =  FN P(H(2) + 1):Y = 0: RETURN
3029  REM XO.X SENDS O TO 0 EXCEPT IN FORCED LOSS SITUATION (OOOXO.XXX)
3030 H(2) = H: IF  FN A(H + 7) = 1 AND  FN A(H + 8) =  - 1 AND  FN A(H + 1)
      = 1 THEN X =  FN P(H + 8):Y =  - X
3040  IF  FN A(H + 2) = 1 AND  FN A(H + 3) = 1 AND Y =  - X THEN 3090
3050  IF Y =  - X THEN Y = 0: RETURN
3060  IF  FN A(H + 2) = 1 AND  FN A(H + 1) =  - 1 AND  FN A(H + 8) = 1 THEN
     X =  FN P(H + 1):Y =  - X
3070  IF  FN A(H + 7) = 1 AND  FN A(H + 6) = 1 AND Y =  - X THEN 3090
3080  IF Y =  - X THEN Y = 0: RETURN
3089  REM ELSE FIND A LEGAL MOVE AND FLIP A COIN
3090 I = 0
3100 I = I + 1: IF I > 9 THEN I = 1
3110  IF A(I) <  >  - 1 OR  FN R(4) < 3 THEN 3100
3120  IF  FN A(I + 8) = 0 AND  FN R(4) < 3 THEN X = I:Y =  FN P(I + 8): RETURN
3130  IF  FN A(I + 1) = 0 AND  FN R(4) < 3 THEN X = I:Y =  FN P(I + 1): RETURN
3140  IF Y <  >  - I AND  FN R(4) < 3 THEN X = I:Y = 0: RETURN
3150  GOTO 3100
3999  REM ***************
3999  REM IF 0 SQUARE CONTAINS AN 'X'
3999  REM ***************
3999  REM .OO -> O.O
4000 H = H(1): GOSUB 6100:H = H(2): GOSUB 6100
4009  REM ELSE FIND A LEGAL MOVE & FLIP A COIN
4010  IF  FN A(H + 1) =  - 1 AND  FN R(4) < 3 THEN X =  FN P(H + 1):Y = H: RETURN
4020  IF  FN A(H + 8) =  - 1 AND  FN R(4) < 3 THEN X =  FN P(H + 8):Y = H: RETURN
4030  IF A(0) =  - 1 AND  FN R(4) < 3 THEN X = 0:Y = H( FN R(2)): RETURN
4040  IF H = H(2) THEN H = H(1): GOTO 4010
4050 H = H(2): GOTO 4010
4999  REM ***************
4999  REM IF 0 SQUARE CONTAINS AN 'O'
4999  REM ***************
4999  REM O.O. -> O..O (A WIN!)
5000 H = H(1): GOSUB 6200:H = H(2): GOSUB 6200
5009  REM ELSE X.X -> XOX (O FROM 0)
5010 H = H(1): GOSUB 6300:H = H(2): GOSUB 6300
5019  REM ELSE OO. -> O.O
5020 H = H(1): GOSUB 6100:H = H(2): GOSUB 6100
5029  REM ELSE FIND A LEGAL MOVE & FLIP A COIN
5030  GOTO 4010
5999  REM TEST FOR OO.X SUBROUTINE
6000  IF  FN A(H + 8) = 1 AND  FN A(H + 1) =  - 1 AND  FN A(H + 2) =  - 1 THEN
     X =  FN P(H + 1):Y = H: POP : RETURN
6010  IF  FN A(H + 1) = 1 AND  FN A(H + 8) =  - 1 AND  FN A(H + 7) =  - 1 THEN
     X =  FN P(H + 8):Y = H: POP : RETURN
6020  RETURN
6099  REM TEST FOR OO. SUBROUTINE
6100  IF  FN A(H + 1) =  - 1 AND  FN A(H + 2) =  - 1 THEN X =  FN P(H + 1):
     Y = H: POP : RETURN
6110  IF  FN A(H + 8) =  - 1 AND  FN A(H + 7) =  - 1 THEN X =  FN P(H + 8):
     Y = H: POP : RETURN
6120  RETURN
6199  REM TEST FOR O.O. SUBROUTINE
6200  IF  FN A(H + 8) =  - 1 AND  FN A(H + 1) =  - 1 AND  FN A(H + 2) = 0 THEN
     X =  FN P(H + 1):Y =  FN P(H + 2): POP : RETURN
6210  IF  FN A(H + 1) =  - 1 AND  FN A(H + 8) =  - 1 AND  FN A(H + 7) = 0 THEN
     X =  FN P(H + 8):Y =  FN P(H + 7): POP : RETURN
6220  RETURN
6299  REM TEST FOR X.X SUBROUTINE
6300  IF  FN A(H + 8) = 1 AND  FN A(H + 1) = 1 THEN X = 0:Y = H: POP : RETURN

6310  RETURN
6999  REM TEST FOR WIN
7000  IF A(0) = 0 OR A(0) =  - P THEN  RETURN
7010 H = H(1): GOSUB 7100: IF Q THEN  RETURN
7020 H = H(2): GOSUB 7100: IF Q THEN  RETURN
7030  VTAB 20
7040  PRINT  CHR$ (7); CHR$ (7); CHR$ (7): REM BEEPS TO SOUND END OF GAME
7050  IF P = 1 THEN  PRINT "YOU WIN"
7060  IF P =  - 1 THEN  PRINT "I WIN"
7070  POP : TEXT : PRINT "DO YOU WISH TO PLAY AGAIN? ";: GET A$
7080  IF A$ = "N" THEN  END
7090  GOTO 9100
7100 Q = 0: IF  FN A(H + 1) =  - P OR  FN A(H + 8) =  - P THEN Q = 1
7110  RETURN
```

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Mu-Torere, continued...

```
7999  REM UPDATE BOARD AND IDENTIFY HOLES
8000 H(1) =  - 1: VTAB 3: HTAB 20
8010  FOR I = 0 TO 9
8020  IF I <  > 0 THEN  VTAB 6: HTAB 5 + 3 * I
8030  IF A(I) = 1 THEN  PRINT "X";
8040  IF A(I) =  - 1 THEN  PRINT "O";
8050  IF A(I) = 0 THEN  INVERSE : PRINT " ";: NORMAL :H(2) = I: IF H(1) =  -
     1 THEN H(1) = I
8060  NEXT : RETURN
8999  REM INTRODUCTION & INITIALIZATION
9000  DIM H(2),A(9)
9010  TEXT : HOME : HTAB 16: INVERSE : PRINT "MU-TORERE": NORMAL : PRINT
9020  PRINT "THE OBJECT OF THE GAME IS TO MAKE IT": PRINT "IMPOSSIBLE FOR Y
     OUR OPPONENT TO MOVE.": PRINT
9030  PRINT "THERE ARE 3 TYPES OF LEGAL MOVE:": PRINT : PRINT "(1) SIDEWAYS
      TO THE NEXT ADJACENT"
9040  PRINT "    SQUARE.  (1 AND 9 ARE ADJACENT).": PRINT : PRINT "(2) TO 0
      IF IT IS EMPTY.": PRINT
9050  PRINT "(3) FROM 0 TO ANY UNOCCUPIED NUMBER."
9060  PRINT : PRINT "YOU AND THE APPLE TAKE ALTERNATING": PRINT "MOVES UNTI
     L THE GAME ENDS."
9070  PRINT : PRINT "TO MOVE, JUST PRESS THE NUMBER YOU ARE": PRINT "MOVING
      FROM AND THE NUMBER YOU ARE": PRINT "MOVING TO.": PRINT
9080  PRINT "YOU PLAY 'X' AND APPLE PLAYS 'O'.": PRINT
9090  INVERSE : PRINT "PRESS ANY KEY TO BEGIN";: NORMAL : GET A$: PRINT A$
9100  TEXT : HOME : FOR I = 1 TO 4:A(I) = 1:A(I + 5) =  - 1: NEXT
9110 A(0) = 0:A(5) = 0
9120  VTAB 4: HTAB 20: PRINT 0: VTAB 7: HTAB 8: FOR I = 1 TO 9: PRINT I;"
     ";: NEXT
9130  GOSUB 8000
9140  POKE 34,12: HOME
9150  PRINT "DO YOU WISH TO GO FIRST (Y/N)? ";: GET A$
9160  PRINT A$: HOME : IF A$ <  > "N" THEN 1000
9170 P =  - 1: REM SELECT ARBITRARY 1ST MOVE FOR APPLE
9180  IF  FN R(3) < 3 THEN A(6) = 0:A(5) =  - 1:X = 6:Y = 5: GOTO 1100
9190 X =  FN R(4) + 5:Y = 0:A(X) = 0:A(0) =  - 1: GOTO 1100
9999  REM VARIABLES:
9999  REM A ARRAY REFLECTS BOARD BY CONTENTS OF ELEMENTS...-1=O,0=EMPTY,1=X
9999  REM H(1) & H(2) CONTAIN THE NUMBERS OF THE EMPTY HOLES.  MAKES DECISI
     ON LOGIC A LOT SIMPLER.
9999  REM X IS LOCATION MOVING FROM, Y IS DESTINATION
9999  REM A$ IS GENERAL INPUT
9999  REM P IS 1 (X) OR -1 (O), USED IN SOME LOGIC TESTS
9999  REM Q IS ONLY A RETURN ANSWER FOR 'TEST FOR WIN' SUBROUTINE
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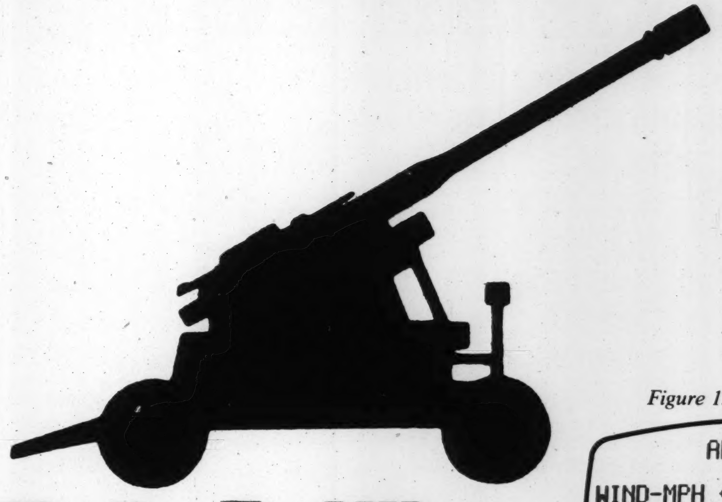


Bally Artillery

John W. Rhodes

In December of 1978 I was ready to buy my first computer system, but my requirements were not easy to meet. I wanted something that could handle arcade-quality games, had high-resolution graphics capability, color display, and Basic in PROM. I was not satisfied with anything my local dealers had to show (no one I visited had a Compucolor, the Apple dealers were showing low-resolution only, and the Atari was only a rumor), but on the basis of the (somewhat premature) advertising for the keyboard/expansion unit, I decided to buy a Bally Professional Arcade. I could use Tiny Basic for a while, and turn it into a "real" machine in just a few short months.

It was just a few short months later that the local dealers began to show Compucolors and high-resolution Apples, and it seemed that the Bally expansion unit was more of a rumor than the Atari 800. I would visit the showrooms, see those beautiful full-size keyboards, watch people work in "real" Basic and be as green as the color monitors.

I particularly liked the artillery game that Compucolor called "Shoot." This game generates a random terrain display and wind factor and positions two artillery emplacements on the screen so that two opponents can take turns trying to obliterate each other. Eventually I resolved that I either had to buy a Compucolor or program this game on my Bally. I chose the latter.

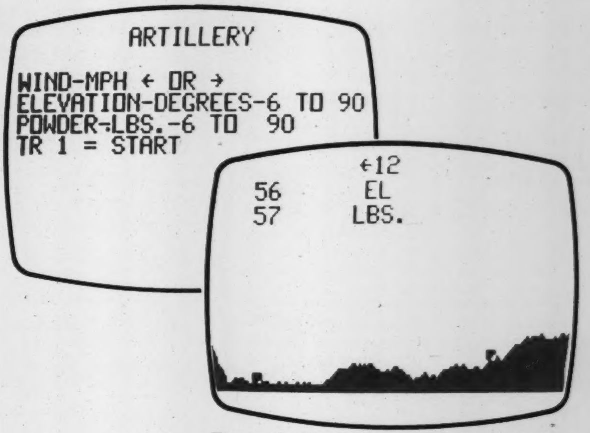
This turned out to be quite a challenge with less than 2K of memory and integer-only Tiny Basic. But the Bally Basic is quite sound for game programming and easy to work with. The greatest difficulty was finding an integer sine routine, but after searching the magazines I found a routine to adapt to my purpose. I started out using a full ballistic equation, but soon found by experimentation that I could use an approximation. This eliminated an integer square-root routine and added speed in the bargain.

I spent approximately two months writing, debugging, and fine-tuning the program, but it was worth the effort.

A few months later I did buy the Compucolor and have been using it ever since. I'm well satisified with it and use it for a variety of tasks. But my wife and I still enjoy the Bally for its games, especially the artillery game.

John W. Rhodes, Box 592, Belmont, CA 94002.

Figure 1. Player instructions.



```
        ARTILLERY

WIND-MPH ← OR →
ELEVATION-DEGREES-6 TO 90
POWDER-LBS.-6 TO  90
TR 1 = START
```

```
            ←12
   56       EL
   57       LBS.
```

Figure 2. Player inputs are prompted on screen. Player sees values on screen as knob is turned. Pulling trigger enters value to program.

Explanation of the Program

Lines 10-28	print the introduction and wait for the player to press the trigger.
Lines 40-88	generate random terrain features and gun emplacements.
Lines 90-94	set and display the wind velocity.
Lines 100-140	input the elevation via knob, print the elevation and record when the trigger is pressed. They also calculate relative sine and cosine.
Lines 150-182	input powder via knob, print and record when the trigger is pressed. They also clear prompters and print elevation and powder values on the player's side of the screen.
Lines 190-306	compute shell movement and decide if a shell has 1) hit the target, 2) hit the ground, or 3) moved off the screen (left or right). If none of the above, a dot is printed and its position recorded.
Lines 400-408	clear the dots to prepare for the next player's turn.
Lines 500-514	make the explosion and wait for the trigger input to start the next game.
Lines 600-612	make a shell crater in ground.

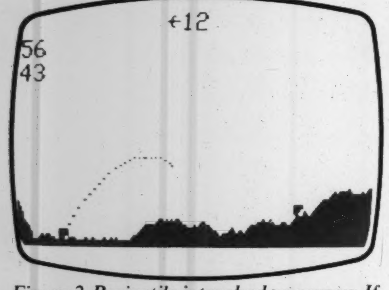
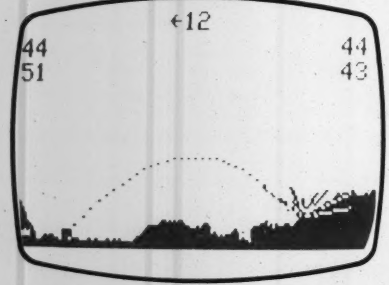


Figure 3. Projectile is tracked on screen. If the projectile impacts the ground (or goes off screen) the track is erased before the next player's turn.

Bally Artillery Listing by John W. Rhodes.
Note: Parenthetical comments are not part of the program.

```
10  CLEAR                        (Introduction)
12  PRINT"         ARTILLERY"    (9 spaces)
14  PRINT
18  PRINT" WIND-MPH ←OR→"        (1 space)
20  PRINT" ELEVATION-DEGREES-6 TO 90"
22  PRINT" POWDER-LBS.-6 TO 90"
24  PRINT" TR 1 = START"
26  IF TR(1)=1 GOTO 40
28  GOTO 26
40  M=1                          (Start with Player 1)
50  CLEAR:FC=165;BC=9            (Generate Terrain)
52  B=RND(40);B=-B
54  I=RND(40)-70;V=RND(40)+30
60  FOR A=1 TO 4
62  C=Ax40-120;D=RND(3)
64  FOR E=1 TO 40
66  H=RND(3);IF D=1 B=B+H
68  IF D=2 B=B+H-2
70  IF D=3 B=B-H
72  IF B>-5 B=-5;D=2
74  IF B<-42 B=-42:D=2
76  C=C+1;LINE C,-44,4;LINE C,B,1
78  IF C=I J=B
80  IF C=V K=B
82  NEXT E
84  NEXT A
86  BOX I,J+2,4,4,3              (Fix Gun Emplacement)
88  BOX V,K+2,4,4,3
90  L=RND(61)-31                 (Generate Wind)
92  CX=-8;CY=40;IF L>0 PRINT" ",#0,L,#0,"→"
94  IF L<0 PRINT"←",#0,-L
100 Z=0;B=512;R=1;E=1          (Initialize Sine Routine)
102 IF M=-1 R=2                  (Start Input Routine)
104 CX=-5;CY=31;PRINT"EL";NT=0
106 C=KN(R)÷6+24                 (C is Elevation)
108 IF M=1 CX=-53
110 IF M=-1 CX=45
112 CY=31;PRINT #0,Cx2
114 IF TR(R)=1 GOTO 120
116 GOTO 106
120 NT=3
```

Figure 4. The aftermath of a startling explosion (complete with bells and whistles).



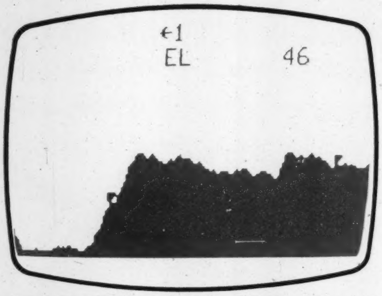


Figure 5. Start of next game. Terrain and wind factors differ dramatically from game to game.

```
130 FOR D=1 TO C                 (Sine Routine)
132 Z=Z+(B÷28);B=B-(Z÷28)
134 NEXT D
136 IF Z>512 Z=512
138 IF B<0 B=0
140 Z=Z÷10;B=B÷10
150 CX=-10;CY=22;PRINT"LBS.";NT=0
152 F=KN(R)÷3+48                 (F is Powder)
154 IF M=1 CX=-53
156 IF M=-1 CX=45
158 CY=22;PRINT #0,F
160 IF TR(R)=1 GOTO 170
162 GOTO 152
170 IF M=1 CX=-72
172 IF M=-1 CX=65
174 CY=31;PRINT #0,Cx2
176 IF M=1 CX=-72
178 IF M=-1 CX=65
180 CY=22;PRINT #0,F
182 BOX 0,26,120,20,2;NT=3;F=Fx4   (Clear Prompters)
190 G=ZxF÷51;H=BxF÷51            (Velocity Vectors)
192 W=0;X=0;H=HxM;E=1            (Initialize Movement)
200 U=(HxL)÷800;U=UxM            (Movement Routine)
202 W=W+(H÷4)+(U÷4)
204 X=X+(G÷4)-2
206 H=H+U;G=G-8;P=W÷10
208 IF M=1 P=P+I
210 IF M=-1 P=P+V
212 Q=X÷10;IF M=1 Q=Q+J+2   (What to do with position)
213 IF M=-1 Q=Q+K+2
214 IF P<-80 GOTO 400
216 IF P>80 GOTO 400
218 IF Q<-43 GOTO 400
220 IF M=1 IF P>(V-4) IF P<(V+4) GOTO 226
222 IF M=-1 IF P>(I-4) IF P<(I+4) GOTO 226
224 GOTO 230
226 IF M=1 IF Q>(K-4) IF Q<(K+4) GOTO 500
228 IF M=-1 IF Q>(J-4) IF Q<(J+4) GOTO 500
230 IF Q>-4 GOTO 300
232 IF PX(P,Q)=1 GOTO 600
300 MU=2;IF Q>44 GOTO 200        (Paint Dot Routine)
302 BOX P,Q,1,1,3
304 @(E)=P;@(E+1)=Q;E=E+2        (Remember Dot Position)
306 GOTO 200
400 M=-M                         (No Hit. Clear Dots)
402 FOR S=1 TO E-1 STEP 2
404 BOX @(S),@(S+1),1,1,3
406 NEXT S
408 GOTO 100
500 FOR N=-5 TO 5                (Hit. Make Explosion)
501 FC=RND(32)x8+4;BC=FC-4
502 IF M=-1 K=J;V=I
504 LINE V,K,4
506 LINE NxRND(5)+V,K+RND(10),3;MU=1
508 NEXT N
510 M=-M                         (Switch Players)
512 IF TR(1)=1 GOTO 50
514 GOTO 512
600 IF M=1 IF P<I+3 GOTO 200   (Shell Impacted Ground)
602 IF M=-1 IF P>V-3 GOTO 200
604 FOR T=1 TO 5
606 MU=4
608 BOX P+T-3,Q+1,1,RND(4),2
610 NEXT T
612 GOTO 400
```

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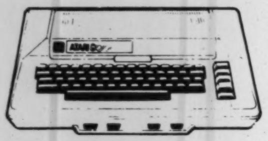

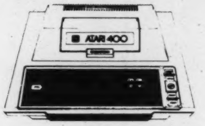

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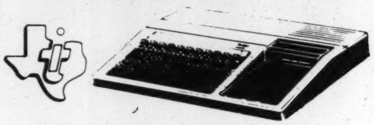

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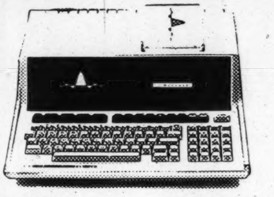

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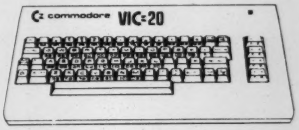

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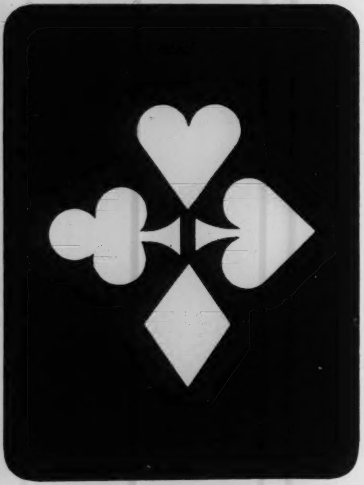

CRAZY 8

John A. Krallmann

Almost every software vendor has a blackjack program, and there are several versions of bridge and poker around, but there are still plenty of card games I've never seen in computer magazines or catalogs. Many of these card games are fun to play, yet simple enough to fit in the average computer hobbyist's system. The program presented here plays Crazy 8, a popular game for people of all ages.

Review of the Rules

In Crazy 8 each player in turn must match the previously played card, either by suit or by value. The eights are wild cards which may be played at any time, and give the person who plays them the right to name the suit of their choice for the next play. If a player has nothing in his hand which he can play, he must draw until he gets something that is playable. The object of the game is to play all the cards in your hand.

Configuration

This program was written for an OSI C4P and uses the OSI graphics characters. It should work without modification on a C2 with 8K of memory. It should work on a C1 system if the display addresses are modified. When the comments and blanks are stripped, it requires about 7K but it might fit in 4K with some modification. If you only have 4K, here are a few things you could try first to reduce the size:

> ***The computer decides which card to play each time by "voting" on each card in its hand.***

The arrays CV, CS, PV, and PS are dimensioned generously. Thirty to 40 would probably be adequate.

The special case in 25000-25300 could be omitted. The text of line 20000 would also have to be omitted in this case.

The instructions could be omitted.

The display routines could be modified, possibly using PRINTs instead of the graphics routines.

The program does not use the color capabilities of the C4P, since I only have a black and white monitor. This is an enhancement which could be added.

I have used a USR routine for keyboard input. There are several reasons for this:

The OSI keyboard is a polled keyboard, meaning that if the scrolling of the INPUT statement is to be avoided, the keyboard is read with POKEs and PEEKs. The Basic routine I used originally was so slow that it sometimes missed inputs. The machine language routine is, of course, much faster than any typist.

This program gives an example of how easy it can be to link a machine language routine to OSI Basic. In this case the USR routine uses the keyboard routine in ROM and just interfaces it to Basic so that the data is in the right place. It also defeats the auto repeat so that a key held down too long will not cause an invalid response. An assembly language listing of the USR routine is included in the program listing.

John A. Krallmann, 19 Olympus #2B, Naperville, IL 60540.

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CIRCLE 221 ON READER SERVICE CARD

Crazy 8, continued...

Screen layout is shown in Figure 1. Cards in the player's hand are displayed by suits in a table at the bottom of the screen. At the top of the screen, one small square is displayed for each card in the computer's hand, to show how many cards it has. The "top" card, the card to be played on, is shown in the middle of the screen. Messages are displayed at the left of the top card display.

If you have a system other than an OSI, it should be possible to use most of the program logic if you write your own display and input routines. The display routines in my version are at 5000-10600 and also at 14000, 15800-15900, and 21300. Input routine references appear in 5, 15000-15100, 16400, 19000-19400 and 28700-29200. The POKEs in 20 and 1130 and the assignment to DS in line 1170 are peculiar to the OSI. The screen clears in 10 and 1120 can be modified for your machine. If your machine requires something in particular as the argument to RND, use that instead of what I have. Otherwise, conversion should be fairly straightforward. One of the items in my queue of programs to write is a "plain vanilla" nongraphics version which would run almost anywhere without much conversion. However, since my queue tends to grow at the bottom faster than I get things done at the top, that may be a while!

Program Strategy

I considered a number of different ways of storing the cards to show who had what. I finally ended up using two different methods. In the deck and the stack (the discard pile), the cards have values from 1 to 52 where 1 through 13 represent the ace through king of hearts, 14 through 26 represent the diamonds, 27 through 39 the clubs, and 40 through 52 the spades. In the players' hands, cards are stored in two arrays, one for the suit (1-4), and one for the value (1-13). Since suit and value are the attributes which must be matched, having them in separate arrays makes either attribute easily accessible.

The computer decides which card to play each time by "voting" on each card in its hand. Cards which are not playable receive no votes. Eights receive one vote, so they will only be played as a last resort. Other playable cards receive at least two votes. Additional votes are given if there are more cards of the same suit or value in the computer's hand, since this means the opponent will be less likely to be able to play on them, or if they can play, the computer will be better able to respond. The computer also remembers what the player drew the last time around, and will be more likely to select that suit or value. The computer typically makes its selection in about a second and plays well, which makes for an interesting game.

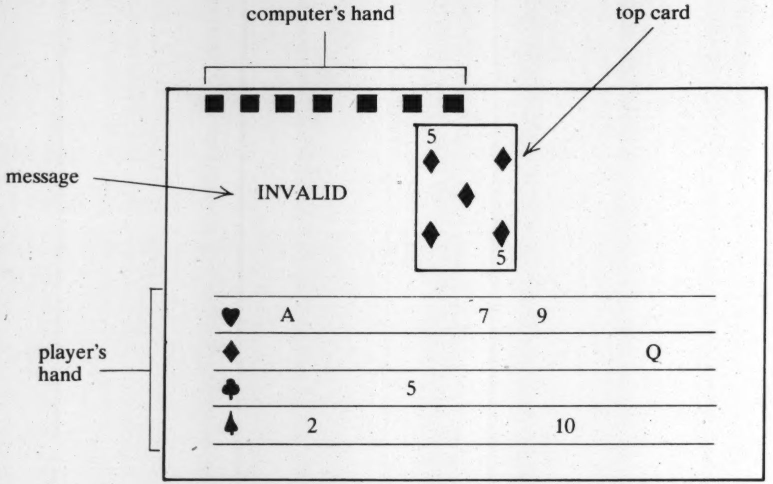

Figure 1. Screen layout for Crazy 8.

Table 1 gives a list of variables used in the program, with explanations. Many of the variable names are chosen as abbreviations and the full name is given in parentheses to help you recognize them in the listing. Most of the processing is done in subroutines, which are marked off with headings in the listing. The comments should give information on the logic flow.

Crazy 8 has received good reviews from everyone who has played it. I hope you enjoy it too. Many of the ideas in this program, such as the display routines, can be used in other card games as well. If you're looking for a good programming challenge, try looking through a book on card games and find one you can implement on your system. ☐

Table 1. List of variables.

A$	Input from keyboard, answer to questions (Answer)
AD	Address at which to display a card in player's hand (ADdress)
BE	Subscript of the best playable card in the hand (BEst)
CL	How many cards in computer's hand (Computer Length)
CR	Address at which to begin display of top card (CaRd)
CS	Array holding the suits of cards in computer's hand (Computer Suit)
CV	Array holding the values of cards in computer's hand (Computer Value)
DK	Array holding deck of cards (DecK)
DS	Address at which to begin display of computer's hand (Display Start)
FL	Flags which suit person named if they just played an 8 and only have one card left (FLag)
HI	Highest vote received on any card in computer's hand (HIgh vote)
I	Loop counter
J	Loop counter
K	Loop counter
KI	One character keyboard input during play (Keyboard Input)
MC	Machine code data for USR routine (Machine Code)
NC	Number of clubs in computer's hand (Number of Clubs)
ND	Number of diamonds in computer's hand (Number of Diamonds)
NH	Number of hearts in computer's hand (Number of Hearts)
NS	Number of spades in computer's hand (Number of Spades) Also used to count the number of cards in whatever suit is currently being considered (Number of Suit)
NV	Number of cards of a given value in computer's hand (Number of Value)
OS	What suit player is out of--what they drew for last (Out Suit)
OV	What value player drew for last (Out Value)
PA	Address of beginning of display of player's hand (Player Address)
PL	Length of player's hand (Player Length)
PS	Array holding suits of cards in player's hand (Player Suit)
PV	Array holding values of cards in player's hand (Player Value)
R1	Random number in shuffle routine (Random #1)
R2	Random number in shuffle routine (Random #2)
S	Suit of card player wants to play (Suit)
SK	Array holding cards currently in stack or pile (StacK)
SL	Length of stack (Stack Length)
ST$	Buffer for output message (Output STring)
SV	Temporary storage in shuffle routine (SaVe)
SY	Holds numeric value of graphic symbol for heart, club, etc (SYmbol)
TS	Suit of top card (Top Suit)
TU	Whose turn it is (1=player, 2=computer) (TUrn)
TV	Value of top card (Top Value)
V	Value of card player wants to play (Value)
VI$	Possible valid keyboard inputs during play (Valid Inputs)
VT	Vote on a card (how playable it is) (VoTe)

Crazy 8 Program Listing.

```
1 REM ----------------------CRAZY 8------------------------
2 REM SET MEMORY SIZE TO ALLOW ROOM FOR USR ROUTINE
3 REM ASSUMES A SYSTEM WITH 8K OF MEMORY
5 POKE 133,231:POKE 134,31
7 REM CLEAR SCREEN AND PRINT GAME TITLE
10 FOR I=1 TO 30: PRINT: NEXT I: PRINT TAB(20);"CRAZY 8": PRINT
15 REM SET DISPLAY TO 64 CHARACTERS PER LINE WHILE PRINTING INSTRUCTIONS
20 POKE 56832,1: GOSUB 28000
25 REM SET UP ARRAYS
30 DIM DK(52),CV(49),CS(49),PV(49),PS(49),SK(51)
40 INPUT "DO YOU WANT TO PLAY FIRST";A$
45 REM ASSUME YES, IF THEY SAY NO THEN CHANGE TU TO SHOW COMPUTER'S TURN
50 TU=1: IF LEFT$(A$,1)<>"Y" THEN TU=2
55 REM GO INITIALIZE THINGS
60 GOSUB 1000
90 REM GO TO APPROPRIATE SUBROUTINE DEPENDING ON WHOSE TURN IT IS
100 ON TU GOSUB 15000,20000
105 REM CHECK IF PERSON IS OUT OF CARDS (THEY WON)
106 REM IF SO SET UP TO DO NEXT HAND
110 IF PL=0 THEN PRINT "YOU WON!": GOTO 40
115 REM DID COMPUTER WIN?
120 IF CL=0 THEN PRINT "I WON.": GOTO 40
130 REM IF NOBODY WON, IT'T NOW THE OTHER PERSON'S TURN TO PLAY
150 IF TU=1 THEN TU=2: GOTO 100
170 IF TU=2 THEN TU=1: GOTO 100
200 REM-------------------------------------------------------------
300 REM                INITIALIZATION ROUTINE
400 REM-------------------------------------------------------------
900 REM FIRST SET UP DECK WITH VALUES FROM 1 TO 52
1000 FOR I=1 TO 52: DK(I)=I: NEXT I
1050 REM DECK NOW HAS 52 CARDS, STACK HAS 0, EACH PLAYER HAS 0
1070 DL=52: SL=0: PL=0: CL=0
1080 REM INFORM PLAYER THAT YOU ARE BUSY
1090 PRINT "SHUFFLING";
1095 REM SHUFFLE 5 TIMES JUST TO BE SURE THEY'RE WELL MIXED.
1096 REM PRINT A DOT EACH TIME TO LET PERSON KNOW YOU'RE WORKING
1097 REM ON SOMETHING AND AREN'T JUST SITTING THERE
1100 FOR I=1 TO 5: GOSUB 11000: PRINT "."; : NEXT I
1110 REM CLEAR THE SCREEN
1120 FOR I=1 TO 32: PRINT: NEXT I
1125 REM DISABLE CONTROL-C FUNCTION AND SET SCREEN TO 32 WIDE
1130 POKE 530,1: POKE 56832,0
1150 REM GO SET UP THE DISPLAY OF THE PLAYER'S HAND AND
```

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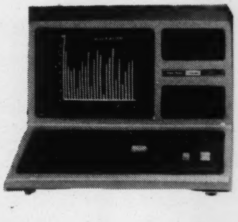

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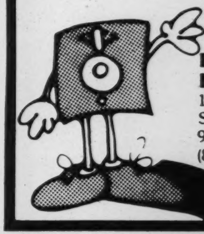

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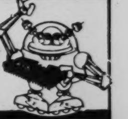

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Crazy 8, continued...

```
1160 REM SET COMPUTER HAND DISPLAY ADDRESS TO 53376
1170 GOSUB 8000: DS=53376
1180 REM DEAL 7 CARDS TO EACH PLAYERS, DISPLAYING IT IN EACH CASE
1200 FOR I=1 TO 7: GOSUB 12000: GOSUB 13000: GOSUB 8500
1250 GOSUB 14000: NEXT I
1280 REM NEXT CARD IN DECK WILL BE THE TOP CARD
1290 REM CALCULATE IT'S SUIT AND VALUE AND PUT IT ON THE STACK
1300 TS=INT((DK(DL)-1)/13)+1: TV=DK(DL)-(TS-1)*13: SK(1)=DK(DL)
1325 REM ONE IN STACK, ONE LESS IN DECK
1350 SL=1: DL=DL-1
1375 REM DRAW TOP CARD ON SCREEN
1400 GOSUB 9000: RETURN
4000 REM---------------------------------------------------------
4500 REM       PRINT A MESSAGE ON SCREEN
4700 REM---------------------------------------------------------
4800 REM MESSAGE TO BE DISPLAYED IS PASSED TO ROUTINE IN ST$
4900 REM FIRST CLEAR OUT THE DISPLAY AREA
5000 FOR K=1 TO 8: POKE 54016+K,32: NEXT K
5025 REM NOW PRINT STRING
5050 FOR K=1 TO LEN(ST$)
5100 POKE 54016+K,ASC(MID$(ST$,K,1))
5200 NEXT K: RETURN
7000 REM----------------------------------------------------------
7100 REM   PRINT GRID FOR DISPLAY OF PLAYER'S HAND
7200 REM----------------------------------------------------------
7500 REM SET STARTING DISPLAY ADDRESS
8000 PA=54272
8050 POKE HEART, DIAMOND, CLUB, AND SPADE IN POSITION
8100 POKE PA,229: POKE PA+128,232
8200 POKE PA+256,230: POKE PA+384,231
8225 REM PRINT LINES BETWEEN ROWS TO SEPARATE SUITS
8250 FOR K=0 TO 32: POKE PA+K-64, 131: POKE PA+K+64,131
8275 POKE PA+K+192,131: POKE PA+K+320,131: POKE PA+K+448,131
8300 NEXT K: RETURN
8400 REM----------------------------------------------------------
8420 REM   DISPLAY ONE CARD IN THE PLAYER'S HAND
8440 REM----------------------------------------------------------
8460 REM FIND THE ADDRESS OF WHERE TO DISPLAY THIS CARD
8500 AD=PA+128*(PS(PL)-1)+2*PV(PL)+4
8510 REM IF ACE THEN PRINT AN 'A'
8520 IF PV(PL)=1 THEN POKE AD,65: RETURN
8530 REM IF 2 TO 9 POKE OUT THAT ASCII VALUE
8550 IF PV(PL)<10 THEN POKE AD,PV(PL)+48: RETURN
8600 REM DO TENS AND FACE CARDS
```

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CIRCLE 120 ON READER SERVICE CARD

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8650 ON PV(PL)-9 GOTO 8670,8700,8730,8760
8660 REM TENS
8670 POKE AD,49: POKE AD+1,48: RETURN
8690 REM JACK
8700 POKE AD+1,74: RETURN
8720 REM QUEEN
8730 POKE AD+1,81: RETURN
8750 REM KING
8760 POKE AD+1, 75: RETURN
8800 REM------------------------------------------------------------
8850 REM       DISPLAY TOP CARD
8900 REM------------------------------------------------------------
8950 REM SET STARTING ADDRESS, THEN DRAW OUTLINE
9000 CR=53453
9005 REM DRAW TOP AND BOTTOM OF CARD
9010 FOR K=0 TO 6: POKE CR+K,144
9020 POKE CR+K+640,145: NEXT K
9035 REM DRAW SIDES OF THE CARD
9050 FOR K=1 TO 9: POKE CR+64*K,146
9070 POKE CR+64*K+6,147: NEXT K
9100 REM -------- DISPLAY THE TOP CARD ITSELF-------------------
9200 REM FIRST CLEAR OUT THE AREA
9500 FOR J=1 TO 5:FOR K=1 TO 9
9510 POKE CR+J+64*K,32: NEXT K: NEXT J
9520 REM DETERMINE PROPER SYMBOL FOR VALUE OF CARD
9530 REM FOR ACE USE 'A'
9540 IF TV=1 THEN SY=65
9545 REM 2 TO 9 USE ASCII EQUIVALENT OF NUMBER
9550 IF TV>1 AND TV<10 THEN SY=TV+48
9555 REM 10 IS SPECIAL CASE--NEEDS TWO CHARACTERS
9560 IF TV=10 GOTO 9620
9565 REM DO FACE CARDS (J, Q, K)
9570 IF TV=11 THEN SY=74
9580 IF TV=12 THEN SY=81
9590 IF TV=13 THEN SY=75
9595 REM DISPLAY VALUE AT CORNERS OF CARD
9600 POKE CR+65,SY: POKE CR+581,SY: GOTO 9700
9610 REM SPECIAL CASE--2 CHARACTERS FOR 10
9620 POKE CR+65,49: POKE CR+66,48
9630 POKE CR+580,49: POKE CR+581,48
9650 REM DETERMINE SUIT SYMBOL TO USE (HEART, DIAMOND, CLUB, OR SPADE)
9700 ON TS GOTO 9710,9720,9730,9740
9710 SY=229: GOTO 9750
9720 SY=232: GOTO 9750
9730 SY=230: GOTO 9750
9740 SY=231
9745 REM FACE CARDS ARE DIFFERENT
9750 IF TV>10 GOTO 10100
9755 REM DISPLAY VALUES FROM ACE THRU 9
9760 ON TV GOTO 9810,9820,9830,9840,9850,9860,9870,9880,9890,9900
9810 GOSUB 9910: RETURN
9820 GOSUB 9920: RETURN
9830 GOSUB 9920: GOTO 9810
9840 GOSUB 9940: GOTO 9820
9850 GOSUB 9940: GOTO 9830
9860 GOSUB 9960: GOTO 9840
9870 GOSUB 9980: GOTO 9860
9880 GOSUB 9990: GOTO 9840
9890 GOSUB 9980: GOTO 9880
9900 GOSUB 10030: GOTO 9890
9905 REM SUBROUTINES DISPLAY SUIT SYMBOL AT PROPER LOCATIONS
9910 POKE CR+323,SY: RETURN
9920 POKE CR+129,SY: POKE CR+517,SY: RETURN
9940 POKE CR+133,SY: POKE CR+513,SY: RETURN
```

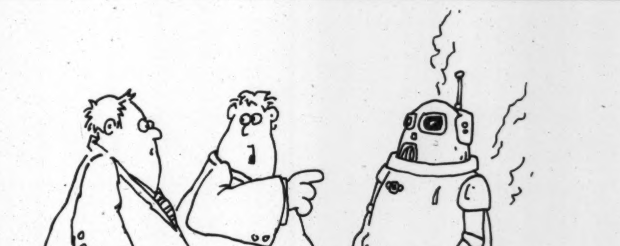

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CJM Microsystem

For the Apple II

The CJM Microsystem for the Apple II
The CJM Microsystem now provides Apple owners with the hardware they need to interface joysticks, sense external inputs, and control other devices such as audio or video recorders. The applications are endless.

Institutional Standards
All metal chassis and heavy duty cables and connectors allow the CJM Microsystem to meet the demands of the educational environment.

A Variety of Applications
The Microsystem can be used for many applications from games to sophisticated computer assisted instruction.
The Miscrostik can be used for graphics input, menu selection, or any screen oriented function.
The output modules such as the Microbox can run appliances, lamps, motors, relays or other loads from keyboard or program commands.
The input modules can sense temperature, light, or sound to provide external information.
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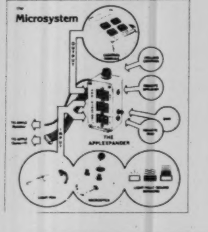

The Applexpander
The APPLEXPANDER is the heart of the CJM MICROSYSTEM. The Applexpander plugs into the Apple Game I/O socket. Once the expander is installed there will never be another need to access the game socket. The expander buffers the input and output signals to the Game I/O. Providing the added safety needed to interface to the outside world.
The two input sockets accept a Microstik, Light Pen or an assortment of input devices such as temperature, audio or light sensors.
The output socket will drive the AC Control Box, Relay Modules, LED Arrays and other controllers.
The APPLEXPANDER + S includes an Auxiliary Speaker/Headphone Jack, and Volume Control. The Apple speaker is automatically muted when a speaker is plugged into the remote jack. The volume control adjusts the sound level. When an external speaker (not included) is used, the sound quality of the Apple increases dramatically.

Microstik
The CJM MICROSTIK is a dual axis joystick. It features an all metal rugged chassis, with a heavy duty cable and Jones plug. Each Microstik includes two pushbuttons for interactive control. Additional circuitry reduces the current draw so that two Microstiks can safely be used simultaneously through the game socket. These are high quality units constructed to withstand abuse. Extension cables are available as accessories.

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CIRCLE 126 ON READER SERVICE CARD

Crazy 8, continued...

```
 9960 POKE CR+321,SY: POKE CR+325,SY: RETURN
 9980 POKE CR+195,SY: RETURN
 9990 POKE CR+257,SY: POKE CR+385,SY
10010 POKE CR+261,SY: POKE CR+389,SY: RETURN
10030 POKE CR+451,SY: RETURN
10070 REM DRAW A FACE FOR FACE CARDS (EYES, NOSE, AND MOUTH)
10100 POKE CR+193,SY: POKE CR+197,SY: POKE CR+323,193
10300 POKE CR+386,192: POKE CR+387,128: POKE CR+388,194
10500 POKE CR+449,198: POKE CR+453,196: POKE CR+514,197
10600 POKE CR+516,195: POKE CR+515, 131: RETURN
10700 REM---------------------------------------------------------
10800 REM               SHUFFLE ROUTINE
10900 REM---------------------------------------------------------
10950 REM INTERCHANGE CARDS 100 TIMES
11000 FOR J=1 TO 100
11050 REM GENERATE 2 RANDOM NUMBERS AND EXCHANGE CARDS THEY POINT TO
11100 R1=INT(RND(R1)*DL+1)
11200 R2=INT(RND(R2)*DL+1)
11300 REM IF SAME, DON'T EXCHANGE CARD WITH ITSELF
11400 IF R1=R2 GOTO 11100
11450 REM INTERCHANGE CARDS
11500 SV=DK(R1)
11700 DK(R1)=DK(R2)
11800 DK(R2)=SV
11900 NEXT J: RETURN
11840 REM----------------------------------------------------------
11860 REM        COMPUTER DRAWS A CARD
11880 REM----------------------------------------------------------
11900 REM ADD ONE TO LENGTH OF HAND
12000 CL=CL+1
12025 REM DETERMINE SUIT AND VALUE AND STORE IN COMPUTER'S HAND
12050 CS(CL)=INT((DK(DL)-1)/13)+1
12100 CV(CL)=DK(DL)-(CS(CL)-1)*13
12125 REM DISPLAY THE FACT THAT COMPUTER HAS ANOTHER CARD
12150 GOSUB14000
12175 REM DECK IS SHORTER BY 1
12200 DL=DL-1
12225 REM IF THERE ARE STILL CARDS LEFT IN THE DECK, YOU'RE DONE
12250 IF DL>0 THEN RETURN
12275 REM IF DECK IS EXHAUSTED, TURN OVER THE STACK AND SHUFFLE IT
12300 FOR K=1 TO SL-1: DK(K)=SK(K): NEXT K
12350 REM SAVE THE TOP CARD FROM THE DISCARD PILE, DON'T SHUFFLE IT
12375 REM SET LENGTHS OF DECK AND STACK
12400 SK(1)=SK(SL): DL=SL-1: SL=1
```

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CIRCLE 205 ON READER SERVICE CARD

```
12450 REM TELL PLAYER YOU ARE SHUFFLING, THEN DO SO
12500 ST$="SHUFFLING": GOSUB 5000: GOSUB 11000
12600 REM WHEN DONE, WIPE OUT MESSAGE
12700 ST$="         ": GOSUB 5000: RETURN
12800 REM-------------------------------------------------------------
12900 REM           PLAYER DRAWS A CARD
12950 REM-------------------------------------------------------------
12975 REM ADD A CARD TO PLAYER'S HAND
13000 PL=PL+1
13100 PS(PL)=INT((DK(DL)-1)/13)+1
13200 PV(PL)=DK(DL)-(PS(PL)-1)*13
13250 REM DISPLAY IT
13300 GOSUB 8500
13350 REM FROM HERE ON IT'S THE SAME AS IF COMPUTER DRAWS A CARD
13400 GOTO 12200
13600 REM-------------------------------------------------------------
13700 REM        DISPLAY A CARD IN COMPUTER'S HAND
13800 REM-------------------------------------------------------------
13900 REM DISPLAY ONE SQUARE ON SCREEN FOR EACH CARD IN HAND
14000 POKE DS+2*CL,161: RETURN
14200 REM-------------------------------------------------------------
14300 REM
14400 REM        ROUTINE TO ALLOW PERSON TO PLAY A CARD
14500 REM
14600 REM-------------------------------------------------------------
14900 REM INITIALIZE SUIT AND VALUE TO 0, THEN GET PLAYER'S INPUT
15000 V=0: S=0: KI=USR(KI)
15005 REM IF THEY WANT TO "FISH", DRAW A CARD, KEEP TRACK OF WHAT
15006 REM THEY'RE OUT OF, AND GET ANOTHER INPUT
15010 IF KI= ASC("F") THEN GOSUB 13000: OS=TS: OV=TV: GOTO 15000
15020 REM FIGURE OUT WHAT VALUE OF CARD THEY INPUT
15030 RESTORE: FOR K=1 TO 13: READ VI$
15040 DATA A,2,3,4,5,6,7,8,9,0,J,Q,K
15050 IF KI=ASC(VI$) THEN V=K: GOTO 15100
15070 NEXT K
15075 REM NO MATCH, INPUT WAS INVALID, TELL THEM SO AND TRY AGAIN
15080 ST$="INVALID": GOSUB 5000: GOTO15000
15090 REM INPUT THE SUIT AND DETERMINE WHICH THEY WANT
15100 KI=USR(KI): GOSUB 19000
15110 REM IF SUIT WAS INVALID, START OVER WITH INPUT
15120 IF S<1 GOTO 15080
15150 REM FIND OUT IF THE CARD THEY SELECTED IS A LEGAL PLAY
15200 IF V<>8 AND V<>TV AND S<>TS GOTO 15080
15250 REM LOCATE THE CARD IN THEIR HAND
```

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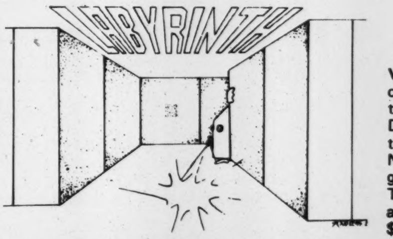

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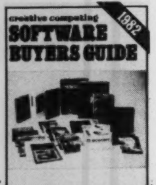

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Crazy 8, continued...

```
15300 FOR BE=1 TO PL: IF V=PV(BE) AND S=PS(BE) GOTO 15500
15350 REM KEEP LOOKING, IF NOT FOUND START OVER WITH INPUT
15400 NEXT BE: GOTO 15080
15450 REM MAKE SURE THE "INVALID" MESSAGE IS ERASED
15500 ST$="          ": GOSUB 5000
15550 REM ADD THEIR CARD TO THE STACK
15600 SL=SL+1: SK(SL)=PV(BE)+13*(PS(BE)-1)
15650 REM MAKE IT THE TOP CARD AND DISPLAY IT
15700 TV=PV(BE): TS=PS(BE): GOSUB 9500
15750 REM FIND WHERE ON THE SCREEN THE CARD WAS DISPLAYED IN HAND
15800 AD=PA+128*(PS(BE)-1)+2*PV(BE)+4
15850 REM ERASE FROM PLAYER'S DISPLAY
15900 POKE AD,32: POKE AD+1, 32
15950 REM MOVE THE REST OF PLAYER'S CARD DOWN IN ARRAY TO FILL THE
15970 REM HOLE MADE BY THE CARD JUST PLAYED
16000 FOR J=BE TO PL-1: PV(J)=PV(J+1)
16100 PS(J)=PS(J+1): NEXT J: PL=PL-1
16150 REM IF IT WASN'T AN 8 OR PLAYER WON, ROUTINE IS DONE
16200 IF TV<>8 OR PL=0 THEN RETURN
16250 REM THEY PLAYED AN 8, FIND OUT WHAT SUIT THEY WANT
16300 ST$="SUIT?": GOSUB 5000
16400 KI=USR(KI): S=0: GOSUB 19000
16450 REM IF INVALID, TRY AGAIN
16500 IF S=0 GOTO 16400
16750 REM MAKE THEIR CHOICE THE "TOP SUIT", ERASE MESSAGE AND RETURN
17000 TS=S: ST$="      ": GOSUB 5000: RETURN
18000 REM------DETERMINE WHAT SUIT THEY INPUT-----
19000 IF KI=ASC("H") THEN S=1
19100 IF KI=ASC("D") THEN S=2
19200 IF KI=ASC("C") THEN S=3
19300 IF KI=ASC("S") THEN S=4
19400 RETURN
19700 REM-------------------------------------------------------
19800 REM
19850 REM         COMPUTER PLAYS A CARD
19900 REM
19950 REM-------------------------------------------------------
19960 REM CHECK FOR SPECIAL CASE--PLAYER HAS LAST CARD AND LAST
19970 REM PLAYED AN 8.  IF SO, 75% OF THE TIME ASSUME THEY NAMED
19975 REM THE SUIT OF THEIR LAST CARD AND THEREFORE COMPUTER
19980 REM SHOULD PLAY AN 8 AND CHANGE THE SUIT RATHER THAN PLAY
19985 REM SOMETHING THAT WOULD CAUSE A LOSS. THE OTHER 25% OF
19990 REM THE TIME, ASSUME PLAYER IS LYING AND HOPING YOU'LL CHANGE
19995 REM TO THE SUIT THEY REALLY HAVE. IN THAT CASE PLAY NORMALLY.
20000 IF PL=1 AND TV=8 AND RND(1)>.25 GOTO 25000
20005 REM RESET FLAG AND HIGH VOTE
20010 FL=0: HI=0
20050 REM VOTE ON EACH CARD IN TURN, TO FIND THE BEST ONE TO PLAY
20100 FOR I=1 TO CL: VT=0
20105 REM IF IT'S AN 8 GIVE IT ONLY ONE VOTE, PLAY AS LAST RESORT
20110 IF CV(I)=8 THEN VT=1: GOTO 20540
20115 REM IF NOT A LEGAL VALID PLAY, FORGET THIS CARD
20120 IF TS<>CS(I) AND TV<>CV(I) GOTO 20540
20125 REM IT'S PLAYABLE, GIVE IT 2 VOTES AND FIND OUT HOW MANY
20126 REM OTHER CARDS YOU HAVE OF THE SAME SUIT AND VALUE
20130 VT=2: NV=0: NS=0
20150 REM IF YOU HAVE OTHERS OF SAME VALUE OR SUIT, IT'S A BETTER PLAY
20200 FOR J=1 TO CL
20240 IF CV(J)=CV(I) THEN NV=NV+1
20260 IF CS(J)=CS(I) AND CV(J)<>8 THEN NS=NS+1
20280 NEXT J
20290 REM GIVE IT 1 VOTE FOR EACH ADDITIONAL CARD OF THE SAME VALUE
20300 IF NV>1 THEN VT=VT+NV-1
20310 REM IF MORE THAN ONE OF SUIT GIVE IT AN EXTRA VOTE, PLUS ONE
20315 REM FOR EACH ADDITIONAL CARD OF THE SUIT
20320 IF NS>1 THEN VT=VT+NS
20350 REM IF PLAYER WAS OUT OF THIS SUIT, 2 MORE VOTES
20400 IF OS=CS(I) THEN VT=VT+2
20410 REM IF PLAYER WAS OUT OF THIS VALUE, 1 MORE VOTE
20420 IF OV=CV(I) THEN VT=VT+1
20450 REM IF A BETTER CARD HAS ALREADY BEEN FOUND, FORGET THIS ONE
20500 IF VT<HI GOTO 20540
20510 REM BEST FOUND SO FAR, MARK IT AS SUCH
20520 HI=VT: BE=I
20540 NEXT I
20560 REM IF HI=0, NOTHING PLAYABLE, WILL HAVE TO GO FISH
20600 IF HI<1 GOTO 24000
20700 REM PLAY THE CARD YOU'VE SELECTED
20800 REM PUT ON STACK, MAKE IT TOP CARD, AND DISPLAY IT
21000 SL=SL+1: SK(SL)=CV(BE)+13*(CS(BE)-1)
21100 TV=CV(BE): TS=CS(BE): GOSUB 9500
21200 REM ERASE CARD FROM DISPLAY OF HAND
21300 POKE DS+2*CL,32
21350 REM MOVE CARDS DOWN TO FILL HOLE IN HAND WHERE CARD WAS
21400 FOR I=BE TO CL-1
21500 CV(I)=CV(I+1): CS(I)=CS(I+1): NEXT I: CL=CL-1
21600 REM IF WASN'T 8 OR YOU'VE WON, THIS ROUTINE IS DONE
21700 IF TV<>8 OR CL=0 THEN RETURN
```

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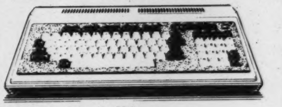

- 8001A Microcomputer (32K)
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Crazy 8, continued...

```
21800 REM IT WAS 8, DECIDE WHICH SUIT. INITIALIZE COUNTERS TO 0
22000 NH=0: ND=0: NC=0: NS=0
22050 REM FIND OUT HOW MANY YOU HAVE OF EACH SUIT
22100 FOR I=1 TO CL: ON CS(I) GOTO 22210,22220,22230,22240
22210 NH=NH+1: GOTO 22250
22220 ND=ND+1: GOTO 22250
22230 NC=NC+1: GOTO 22250
22240 NS=NS+1
22250 NEXT I
22300 REM IF PLAYER IS OUT OF SUIT AND YOU HAVE MORE THAN 1
22400 REM  OF THAT SUIT, GIVE IT 2 MORE VOTES
22500 ON OS+1 GOTO 23000,22510,22520,22530,22540
22510 IF NH>1 THEN NH=NH+2: GOTO 23000
22520 IF ND>1 THEN ND=ND+2: GOTO 23000
22530 IF NC>1 THEN NC=NC+2: GOTO 23000
22540 IF NS>1 THEN NS=NS+2
22800 REM FIND OUT WHICH SUIT IS BEST
23000 HI=0
23010 IF NH>HI AND FL<>1 THEN HI=NH: BE=1: ST$="HEARTS"
23020 IF ND>HI AND FL<>2 THEN HI=ND: BE=2: ST$="DIAMONDS"
23030 IF NC>HI AND FL<>3 THEN HI=NC: BE=3: ST$="CLUBS"
23040 IF NS>HI AND FL<>4 THEN HI=NS: BE=4: ST$="SPADES"
23045 REM IF COULDN'T FIND ANYTHING WITH FLAG, FORGET FLAG AND RETRY
23050 IF HI=0 THEN FL=0: GOTO 23010
23075 REM SET TOP CARD TO NEW SUIT
23100 TS=BE
23200 REM PRINT NEW SUIT ON SCREEN, THEN YOU'RE DONE
23300 GOSUB 5000: RETURN
23500 REM------------------------------------------------------------
23600 REM      COMPUTER HAS TO GO FISHING
23700 REM------------------------------------------------------------
23800 REM DRAW A CARD
24000 GOSUB 12000
24050 REM IF IT'S PLAYABLE, GO TO PLAY IT, OTHERWISE DRAW AGAIN
24100 IF CV(CL)=8 OR CV(CL)=TV OR CS(CL)=TS THEN BE=CL: GOTO 21000
24300 GOTO 24000
24500 REM------------------------------------------------------------
24600 REM     SPECIAL CASE-PLAYER HAS LAST CARD & PLAYED AN 8
24700 REM------------------------------------------------------------
24800 REM SET FLAG TO THE SUIT THEY CHANGED TO SO YOU KNOW WHAT
24900 REM TO AVOID, THEN LOOK TO SEE IF YOU HAVE AN 8 IN YOUR HAND
25000 FL=TS: FOR I=1 TO CL
25025 REM IF YOU HAVE AN 8, PLAY IT, AVOID CHANGING TO SUIT THEY CHOSE
25050 IF CV(I)=8 THEN BE=CL: GOTO 21000
25100 NEXT I
25150 REM NO 8 IN HAND, DRAW TILL YOU GET ONE, THEN PLAY IT
25200 GOSUB 12000: IF CV(CL)=8 THEN BE=CL: GOTO 21000
25300 GOTO 25200
26000 REM------------------------------------------------------------
26200 REM     PRINT OUT INSTRUCTIONS
26400 REM------------------------------------------------------------
28000 PRINT"TO PLAY, TYPE THE NUMBER OF THE CARD, THEN THE SUIT."
28100 PRINT"USE THE LETTERS H, D, C, AND S FOR THE SUITS."
28200 PRINT"USE A FOR ACE; USE J, Q, AND K FOR THE FACE CARDS."
28300 PRINT"USE 0 (ZERO) FOR 10. USE F (FOR 'FISH') IF YOU"
28400 PRINT"NEED TO DRAW. IF YOU TYPE SOMETHING INVALID,"
28500 PRINT"I'LL TELL YOU AND YOU CAN TRY AGAIN."
28600 PRINT: PRINT"GOOD LUCK": PRINT
28700 REM------------------------------------------------------------
28720 REM    SET UP USR ROUTINE TO GET KEYBOARD INPUT
28740 REM------------------------------------------------------------
28760 REM SKIP OVER FIRST DATA-- THAT'S FOR USE ELSEWHERE IN PROGRAM
28800 FOR K=1 TO 13: READ VI$: NEXT K
28850 REM READ IN DATA FOR USR ROUTINE AND PUT IT IN MEMORY
28875 REM 8168 IS START OF AREA SAVED FOR USR ROUTINE BY STATEMENT 5
28880 REM  ASSUMING A SYSTEM WITH 8K OF MEMORY
28900 FOR K=8168 TO 8187: READ MC: POKE K,MC: NEXT K
28925 REM TELL BASIC WHERE THE USR PROGRAM IS LOCATED
28950 POKE 11,232: POKE 12,31
29000 RETURN
29010 REM DATA FOR USR PROGRAM
29100 DATA 32,0,253,168,169,254,141,0,223,173,0
29200 DATA 223,208,246,169,0,32,193,175,96
29300 REM-----------ASSEMBLY LISTING FOR USR ROUTINE-----------
29310 REM
29320 REM        JSR $FD00   ;READ KEYBOARD, USING ROUTINE IN ROM
29330 REM        TAY         ;BASIC REQUIRES LOW BYTE OF ARGUMENT
29340 REM                    ;  TO BE IN Y
29350 REM  ;  WAIT FOR KEY OFF
29360 REM  WAIT: LDA #$FE    ;LOAD KEYBOARD TO DETECT ANY KEY
29370 REM        STA $DF00
29380 REM        LDA $DF00   ;READ KEYBOARD
29390 REM        BNE WAIT    ;KEEP READING TILL ALL KEYS ARE RELEASED
29400 REM        LDA #00     ;SET HIGH BYTE OF ARGUMENT TO ZERO
29420 REM        JSR $AFC1   ;CALL ROUTINE TO RETURN ARGUMENT TO BASIC
29430 REM        RTS         ;END OF ROUTINE
29500 REM
30000 END
```

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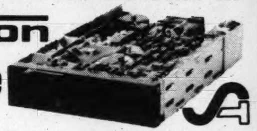

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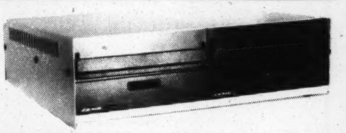

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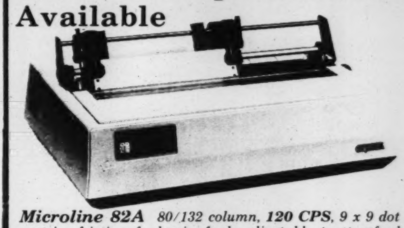

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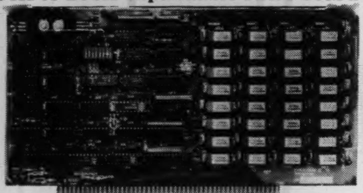

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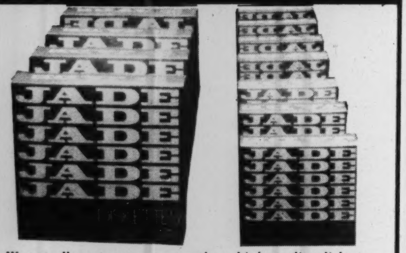

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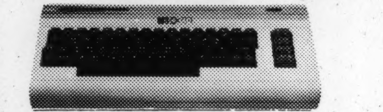

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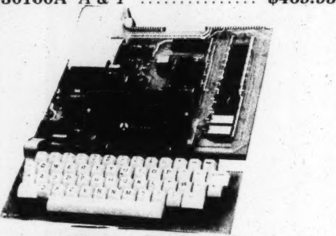

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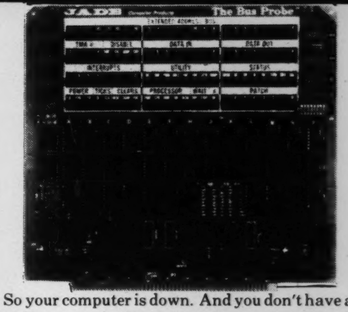

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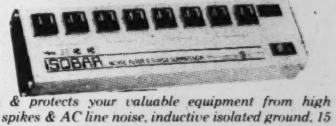

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CIRCLE 173 ON READER SERVICE CARD

The Graph Paper

Part Two: Basic Approaches

David Lubar

Welcome to our first step in the trip through hi-res graphics. (Last month's introduction doesn't count.) This month's article will stick with Basic, covering the commands available from Applesoft. If graphics from Basic strikes you as a confusing area, I hope the following will help change your mind. If you've already mastered the topic, hang in there; we'll be moving on to other areas in a few months. Whatever, try some of the following programs in your Apple. Better yet, try to expand upon them and experiment. None of the programs is graven in stone; all are meant as starting points. Speaking of which, let's get started.

Entry Point

The easiest command to use is HGR. On the outside, it doesn't seem to be doing much. The text page vanishes. A hi-res image or a screen full of garbage might appear for an instant, and then all fades to black. Your text cursor is where you left it, but it can't be seen unless it occupies one of the four bottom lines of the screen.

On the surface, this isn't very impressive. But on the inside, your Apple has done a bit of housekeeping. It has switched on and cleared the memory used for graphics and set up information that allows it to carry out other graphics commands. And that is the key; HGR is the starting point for all sorts of wonders. A similar command, HGR2, is used to set up the second page of graphics, but HGR2 does not provide a convenient text window at the bottom.

This is probably as good a time as any to talk about pages. Unfortunately, the term has two meanings. When doing machine language programming, a page refers to 256 bytes of memory. In the Apple, "page" also refers to an area that can be used for graphics. There are two hi-res pages. Each is 8K (8192) bytes long, though not all of the 8K is used for display.

> **The main trouble with shape tables is the way the information is compressed.**

Page 1 begins at $2000 (8192 decimal), and page 2 follows at $4000 (16384). If you are new to hex, the preceding numbers may give you an idea of why programmers prefer base sixteen.

When page 1 of hi-res is switched on, the values found in that area of memory appear on the screen. When page two is enabled, it is the values there that determine the display. (If you want to experiment, try giving an HGR command and then poking various values into the area of memory from 8192 to 16383.) For the moment, we'll stick with page 1, though all commands work just as well on either page.

So, you've typed HGR and been greeted with a blank screen. From here, you and your programs will determine what appears.

3H Club

The three primary commands are HGR, HPLOT, and HCOLOR. We've pretty much exhausted the topic of HGR. HPLOT is used both to position the hi-res cursor and to plot points. This hi-res cursor is actually a set of internal coordinates that gives the location where the next plot or draw will occur. Note that, unlike the text cursor, the hi-res cursor is invisible. Nothing flashes on the screen to show the location of the cursor.

HPLOT is used with X and Y coordinates, such as HPLOT 20,30. Which brings us to the topic of screen coordinates. The upper left corner is 0,0. As you move right, the value of the X coordinate increases up to a maximum of 279 (since it starts at 0, this gives a total of 280 points). Y increases as you move down, reaching 191 at the bottom of the screen.

With the text window turned on, you can see only down to position 159, but anything below will still be plotted, and will become visible if full-screen graphics is enabled (POKE 49234,0 will do this).

When using coordinates with Applesoft

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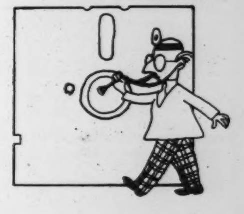

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CIRCLE 154 ON READER SERVICE CARD

Graph Paper, continued...

commands, the X value comes first. For example, to position the hi-res cursor at the center of the top line of the screen, you would use HPLOT 140,0.

While a resolution of 280 by 192 may seem a bit arbitrary, it makes sense when viewed in relation to the text screen. There are 24 rows with 40 letters per row. Each letter requires one byte in memory and seven of the eight bits in a byte are used for hi-res plotting. So 7 bits times 40 bytes gives 280 locations across the screen.

If you look closely at the screen, you'll notice that each letter is seven dots high, and there is a space of one dot between each row of letters. Twenty-four locations down, times eight dots per location, provide the vertical area of 192.

While HPLOT is the basic command for plotting, it alone is not sufficient to put something on the screen. To do that, we need to specify a color and determine which location or locations to plot. The color values go from 0 to 7. There are two blacks and two whites. Though they appear the same on the screen, they are different internally. We'll look at the peculiarities of color in later articles.

Even hard-core machine language types have been known to pass a few hours playing with Applesoft graphics.

For now, the important thing is that the statement HCOLOR = N will cause subsequent plotting to be done in the specified color (with two exceptions that will be covered in a moment).

Values of 0 and 4 are black, 3 and 7 are white, and the remaining values, though they vary depending on the TV used, are green, orange, violet, and blue.

This brings us to the first exception to HCOLOR. Green and orange can only be plotted on odd X locations. Violet and blue appear only on even coordinates. Thus it is possible to specify a vertical line and have nothing appear on the screen.

In essence, the horizontal resolution when using color is 140 pixels; a fact that all Apple programmers must learn to live with. The one advantage of this system is that a shape from a table can be drawn with white but still contain colors. This is done by designing the shape so that every second dot horizontally is not plotted.

Now that color has been specified (use HCOLOR = 3 for starters), it's time to put something on the screen. HPLOT 140,80 will put a dot in the center of the visible hi-res screen. Not very exciting, but it's a start. The strength of HPLOT is that it can be used with variables. For example, the following, entered in the immediate mode, will draw a line across the top of the screen.

HGR: HCOLOR = 3: FOR I = 0 TO 279: HPLOT I,0: NEXT

All kinds of values can be passed to HPLOT, allowing the creation of geometric figures, graphs, etc. To take a simple example, Listing 1 is a program that will plot a circle. Note that, because of the difference in distance between horizontal and vertical points on the screen, the circle is more like an ellipse. Can you find a way to round things out?

Listing 1.

```
1  REM  PROGRAM DRAWS A CRUDE CIR
     CLE
10  HGR
20  HCOLOR= 3
30 XC = 140:YC = 95: REM  DEFINE
     CENTER OF CIRCLE
40 RA = 50: REM  RADIUS
60  FOR I = 0 TO 6.30 STEP .05
65  REM   TRY CHANGING THE ABOVE
     STEP VALUE FOR FINER PLOTTIN
     G
70  HPLOT RA *  SIN (I) + XC,RA *
      COS (I) + YC: REM  PLOT A P
     OINT ON THE CIRCUMFERENCE
80  NEXT I
```

Generally, if there is a formula for something, it can be put on the Apple screen. You may need to scale the results, but HPLOT is a powerful tool. For line drawing, however, HPLOT seems tedious. Fortunately, there is a way to simplify the process.

HPLOT will draw a line between any two sets of coordinates. HPLOT 0,0 to 279,191 will draw a diagonal line from the top left corner of the screen to the lower right. As with point plotting, you can use formulas in line plotting. Listing 2 is the circle program spiced up with radial lines.

Listing 2.

```
1  REM  THE CIRCLE PROGRAM WITH L
     INE DRAWING ADDED
10  HGR
20  HCOLOR= 3
30 XC = 140:YC = 95
40 RA = 50
60  FOR I = 0 TO 6.30 STEP .05
65  REM  NEXT LINE NOW DRAWS A LI
     NE FROM CIRCUMFERENCE TO CEN
     TER
70  HPLOT RA *  SIN (I) + XC,RA *
      COS (I) + YC TO XC,YC
80  NEXT I
```

The line capability of HPLOT can be extended to draw a series of lines. The general syntax is HPLOT X1,Y1 TO X2,Y2 TO X3, Y3... TO XN, YN. HPLOT can also be used to draw from the most recently plotted location (in other words, from the current position of the hi-res cursor).

In this case, the first set of coordinates is omitted. HPLOT TO 0,0 will draw a line from the present location of the hi-res cursor to the upper left corner.

This brings us to the other limitation of HCOLOR. When a color is first defined, it is not yet internally established. This establishment occurs when the hi-res cursor is given new starting coordinates.

Thus, HPLOT 0,0 will use the defined color, HPLOT TO 0,0 will use whatever color was last established internally. The program in Listing 3, which draws a star from data, uses HPLOT to set up an initial position and establish color.

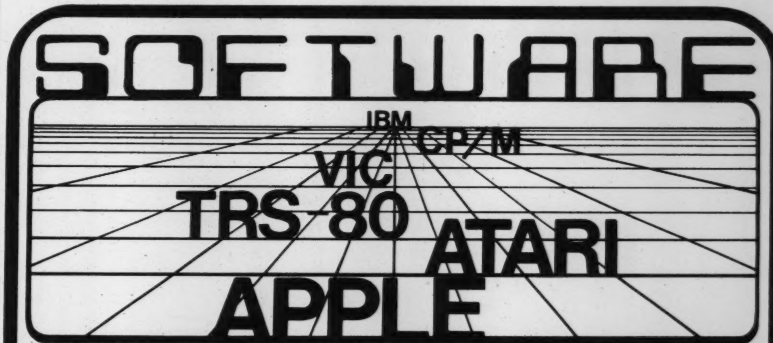
Listing 3.

```
10  HGR
20  HCOLOR= 3
30  HPLOT 10,90
40  FOR I = 1 TO 5
50  READ X,Y
60  HPLOT  TO X,Y
70  NEXT I
80  DATA   200,90,10,10,100,150,1
     80      , 20,10,90
```

HPLOT can be used for setting up borders around the screen, drawing figures, filling areas, and for many other applications. The above covered general use of Basic graphics commands. Before diving into shape tables, I'd like to take a breather and cover some more philosophical areas. □

Buzzy *Hal Gerhardt*

YOU SAY HE DOES THAT EVERY TIME THE TOASTER POPS!
BOING!



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CIRCLE 237 ON READER SERVICE CARD

Hacking

Many fine programmers started out by just fooling around with simple commands, trying different ideas, and, in general, having fun. Even hard-core machine language types have been known to pass a few hours playing with Applesoft graphics. An interesting bit of graphics has often become the inspiration for a new game. Here is an example to get you started.

A few weeks ago, I was passing a rainy evening in Sacramento, hacking on an Apple with Hunter Hancock, a talented programmer who has done some extremely clean machine-language animation. Hunter put the bit of code in Listing 4 into the Apple, explaining it was a short demo he liked to use when he worked in a computer store. The program plots a pair of sine waves, and draws connecting lines at specific intervals.

After looking at the screen for a bit, I decided it would be nice if the "rungs" moved along the wave. We fooled around a bit and came up with a method. This involved plotting each rung then erasing it and replotting it one step further along the curve.

We spent the next two hours trying different variations, including one that moved a figure in a sine pattern and varied the length of the figure.

Along the way, we also found a method that increased the speed of the program greatly, though it was still in Applesoft. Next month, I'll share some of these variations with you. For the moment, see what you can do with it. A good starting point would be to ignore the dots and just plot the rungs. Hack away.

Listing 4.

```
10  HGR
20  FOR I =  - 10 TO 10 STEP .1
30 Y =  SIN (I) * 20
40  HPLOT (I + 10) * 10,Y + 100
45  HPLOT (I + 10) * 10 + 20,Y +
     100
46 T = T + 1: IF T = 5 THEN T = 0
     : HPLOT  TO (I + 10) * 10,Y +
     100
50  NEXT
```

Letters

The response to the call for letters has been extremely gratifying. Many of you took the time to write, and all asked intelligent and important questions. This, more than anything else, will help me learn what information needs to be passed on in this series. As mentioned last month, *Creative Computing* will award a copy of *Shape Master* for the best question each month.

The choice is tough, both because of the quality of the letters and because of the overlap in questions. I want to extend my thanks to everyone who took the time to write. I will try to include as many answers as possible in these articles.

This month, the prize goes to Stephen Berkley of Houston, TX, who asked "How do you create and save a shape table?" This is one of the most frequently asked questions concerning graphics, mostly because people assume that the Apple arcade games they see use such tables.

While advanced programs don't use shape tables, and while I hope you won't either by the end of this series, the topic is worth covering since it can provide a good introduction to such areas as animation and color management. The answer to Stephen's question will take up the rest of this article.

MEMORY DUMP

Table Time

Though the Apple reference manual devotes several pages to shape tables, the topic is tricky enough to merit further explanation here. First, a bit of background.

A shape table uses what is known as the "vector" method. A vector, in this case, is just a command to plot (or not plot) combined with a direction to move. Each vector within the table tells the Apple whether or not to turn on a pixel at the current location, and where to move from there.

The main trouble with shape tables is the way the information is compressed. While a whole byte could be used for each command, this would waste space. Instead, only three bits are used. The reason for this is worth investigating.

First, the vector needs to provide directional information. Four possible directions are allowed; up, right, down, and left. These can be numbered from 0 to 3. Conveniently enough, values from 0 to 3 can be represented using only two bits. For those of you who are new to binary, 00=0, 01=1, 10=2 and 11=3.

The other piece of required information is whether or not to plot. Since this is a binary (yes/no) decision, it can be represented with one bit. A O means don't plot, a 1 means plot. So each entry requires three bits. Since there are eight bits in a byte, each byte can hold two full commands.

The two remaining bits can also be used at times. This is done by limiting their possible interpretations. Only commands for a move without plotting can be used in the final two bits. And if these bits are both zero, they are ignored. So the last two bits are significant only if they contain a value from 1 to 3.

OK, we know that each vector is defined with three bits. The next step is to get the right bit values and put them together in the correct way. Again, the directional part has four possible values. These values are not arbitrary, but move in a clockwise fashion from 00 (decimal 0) for up, to 11 (decimal 3) for left.

If you want the Apple to plot before making the move, tack on a 1 first. If you want nothing plotted, use a 0.

Let's construct several simple shapes, and then compile them into a table. A good example would be a table that could be used to put numbers on the screen.

For this example, each number will be designed within an eight by eight matrix. The number 1 can be created by using the command "plot and move down" eight

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times. Down is represented by 10 (once again. this is binary for 2). so the movement part of the vector would be 10. We want to plot a point. so a 1 is placed before the move value. resulting in a vector of 110. This tells the Apple to plot and move down.

To do the full figure. we need eight such commands. This is where shape tables can become a bit tricky. Just remember that the vectors within each byte are placed from right to left. So our first vector occupies the three lowest locations in the byte.

Representing locations not entered yet with an X. the byte containing only the first vector would be. in binary. XXXXX-110. Tacking on the second vector. we get XX110110. Now. there are two bits left. Since the third vector contains a plot command. it won't fit there. so a second byte is required. The first shape ends up as four bytes. each with a binary value of 00110110.

Since these values will eventually be entered directly through the Apple monitor. they must be converted into hex. And this. believe it or not. is the easiest part of the process.

Consider four binary digits. The digits represent the ones. twos. fours. and eights places. The binary number 0001 is decimal 1. 0010 is two. 0100 is four and 1000 is eight. The highest value. 1111 is 8+4+2+1 or 15 decimal.

Hex is base sixteen. and just as a decimal (or base ten) digit can have a value from 0 to 9. a hex digit can range from 0 to 15. Values from 10 through 15 are represented with the letters A to F.

Now. the highest value of four binary digits is 15. and the highest value of one hex digit is fifteen. which means that each set of four bits can be represented with one hex digit. and a byte can be replaced with two hex digits.

To convert. just separate the byte into two sets of four bits. Find the value and change it to hex. The highest four bits become the higher of the two hex digits. In our example. 00110110 can be broken into 0011 and 0110. The number 0011 is 3 in hex. and 0110 is 6 so the hex value is 36.

Since our first shape has four identical bytes. the shape definition becomes 36.36. 36.36. But the Apple needs a way of sensing the end of a shape. This is marked with a 00. completing the definition.

Let's move on to a shape for the number 2. This should be a bit more interesting than 1. Since it is going to be eight dots across. you might think we would start with eight commands to plot and move right. But that would not be efficient. Each command is performed with a plot followed by a move.

If we repeated the command to plot and move right eight times. we would have eight dots. but the cursor would have moved right to the ninth position. forcing us to back up before continuing. Instead. there should be seven commands to plot and move right. followed by a command to plot and move down.

In general. when you are constructing a shape table. the first step is to plot the shape on graph paper. Then find the shortest path through the shape and represent each step with a vector. The shape for the number 2 can be done with seven commands to plot and move right. followed by three to plot and move down. seven to plot and move left. four to plot and move down. and finally. eight to plot and move right. The direction of the final vector doesn't matter unless you are linking shapes (more on that next month). since once the plot is finished. you don't care where the cursor moves.

So. the vectors for 2 would be 101. 101. 101. 101. 101. 101. 101 (seven commands to plot and move right). 110.110.110 (plot and move down). 111. 111. 111. 111. 111. 111. 111. (plot and move left). 110. 110. 110. 110 (down again). 101. 101. 101. 101. 101. 101. 101. 101 (the final eight moves to the right).

Putting these values into full bytes. we get 00101101. 00101101. 0101101. (next. where the rightward motion ends and the downward motion begins. note that the first of the two vectors occupies the lower position in the byte) 00110101. 00110110. 00111111. 00111111. 00111111. (again. the following byte contains the last of the left moves followed by a downward move) 00110111. 00110110. 00101110. 00101101. 00101101. 00101101.

This brings us to the final vector. Since it ended up as the beginning of a byte. the rest of the byte is padded with 0's. giving us 00000101. Now. these values are converted to hex. giving 2D. 2D. 2D. 35. 36. 3F. 3F. 3F. 37. 36. 2E. 2D. 2D. 2D. 05. Finally. the table is finished off with a 00.

As you can see. the process is tedious and prone to error. If you plan to make extensive use of tables. I strongly recommend using one of the commercial shape programs. Rather than complete the entire number set. I think this space would be better spent filling in a few gaps in the shape creation process and showing how to put the results into a table.

As mentioned. the two highest bits can be used if the command is for a move without plotting. and if the move isn't up. which is marked by zero. So. if you wanted to signify plot and move left. plot and move left. followed by don't plot but move left. the byte would be 01101101. The high two bits contain the command to move without plotting.

Finally. since a zero marks the end of a table. you can't have two commands in a row which move up without plotting. The resulting 0 bits would mark the end of the shape.

Now it's time to make the actual table. Besides shape definitions. the table contains other data. This data is stored in standard lo byte. hi byte fashion. This means that each hex value is represented in reverse order. The two least significant digits come first. followed by the two most significant digits (in the hex number 40AC. AC is the lo byte).

Each table starts off with an entry telling how many shapes are in the table. In our present example. we only have two shapes. In hex. this is 0002. Putting the lo byte first. the table begins with 02.00. Next. the table needs an index.

When the Apple is going to draw a shape. it takes the desired shape number and uses that to get an index value. This index value tells it how far from the start the desired shape begins. Since these index values are dependent on the length of the shapes. the index must be done last.

STAR
SMASH!
Keck

Yes, that's all very well as a game, but how will it do against the real thing?

```
]CALL-151

*6000.6020

6000- 02 00 06 00 0B 00 36 36
6008- 36 36 00 2D 2D 2D 35 36
6010- 3F 3F 3F 37 36 2E 2D 2D
6018- 2D 05 00 00 00 00 00 00
6020- 00
*
```

Figure 1.

The easiest approach is to enter the whole table, leaving space for the index, then to go back and fill it in. Let's enter the monitor and do this for our table.

To enter the monitor, use CALL -151. Now, a good place to put the shape is at 6000 (when in the monitor, all values are hex). Location 6000 sits just above the second hi-res page. To enter values at a location, just type the desired location followed by a colon. Any series of hex values entered will be stored in memory.

It is best to enter only eight or sixteen numbers, then hit return. Start the next line with a colon, followed by the next sequence of numbers. As mentioned, the table begins with a value showing the number of shapes it contains. Next comes the index.

Each entry requires two bytes. Since our table has two shapes, four bytes must be reserved. For now, put 00 in each of these. You'll start out with 6000: 02 00 00 00 00 00 36 36 36 36 00 2D 2D, etc. Now to fill in the index. If you type 6000.6020, the Apple will list all the memory values in that range (see Figure 1). Looking at the table, you can see that the first shape starts at 6006 and the second is at 600B.

As mentioned, the index tells the offset from the beginning of the table. So the offset for the first shape is 06, and the second is 0B. The start of the table, including the index, becomes 02 00 06 00 0B 00. Note again that the index is stored lo byte first. If the second shape had started at 610B, its index entry would have been 0B 01.

To save the table to disk, you need to know the starting address and the length. This was covered last month, but I'll repeat it briefly here. You know the start since you typed in the table (it is 6000 in this case). The length can be found by subtracting the end from the start and adding 1. The disk command is BSAVE TITLE, A$START, L$LENGTH.

We'll be doing more with shape tables, but that will have to wait for next month. Next time we'll also cover shape drawing, animation, screen organization, and advanced techniques from Basic. If you have questions, comments, or anything else to pass on, please write. I need your input. □

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CIRCLE 201 ON READER SERVICE CARD

outpost : atari

David and Sandy Small

For this month's column, we begin a look at Atari DOS, complete with the usual extraneous comments and detours down useful side tracks.

A disk is a very complex piece of hardware. It is a mass storage device; one disk contains about twice the data that fit into the Atari's read-write-memory at one time. In addition, various functions must be supported; these include storage of disk files, random access of data, formatting and copying. All of these are controlled by the Disk Operating System; they are the "support" routines specific to the disk drive and are needed only to run it.

The Atari has a very sophisticated operating system, easily the best in the microcomputer market for the price. It is called the OS (not DOS—that is for the disk alone) and is physically located in the OS 10K ROM cartridge of the 800 and internal to the 400.

The Atari OS is very flexible and can do many unique things because it is "device independent." This means that any input/output device-to-device communications are done not to a specific device, but to a "unit number." Whatever device is assigned to that unit number receives the instructions from the operating system.

For example, let's say that we have output going to unit number 2. An example might be a checkbook balance. Now if that unit number is assigned to device "TV screen," the output goes to the screen. If the unit number is assigned to the printer, the output goes to the printer. The output goes to the device to which the unit number is assigned.

This concept of device independent input/output is very consistent with the rest of the design philosophy of the Atari. For example, colors are not assigned directly; rather, a given screen image is drawn in a color register number. Whatever color is in that color register is then output to the screen. (See November and December 1981 "Outpost.")

The ability to reassign devices is extremely useful. Unfortunately, the workings of CIO (the Central Input/Output system) are a bit beyond the scope of this article.

Short detour (I warned you): Here's one bit of information for advanced users that is worth its weight in gold. In order to direct *all* output going to the TV screen to the printer, use:

C346< A6,EE from the assembler/editor cartridge debugger.

Screen output can be restored with:
C346< A3,F6.

Let me cite an example. I was debugging a game that filled the screen with a graphics display. If output appeared on the screen, it would disturb that display—a rather common problem. By using the above modification, I got the debugging/trace output to appear on the printer instead, leaving the TV image "intact."

Back to Atari DOS. The DOS is a set of assembly language routines dedicated to running the disk drive. They load from disk any time the Atari is turned on with a disk turned on and connected. They are physically located in a file named DOS.SYS on the diskette.

Loading DOS

These routines are absolutely necessary to run the disk drive. If the file named DOS.SYS does not exist, is fouled up, or otherwise cannot be used, then the disk drive can't be used either. The Atari discovers on power-up whether a disk is present and attempts to load DOS.SYS from the plugged-in drive.

If the disk is blank, or anything else is wrong, the message BOOT ERROR appears, and the drive makes an awful "s-nn-aaa-rrr-kk" sound. Don't worry; the snark is the sound of the disk completely resetting its internal functions, the equivalent of "if at first you don't succeed..."

Okay, what happens after the DOS file loads? The Atari takes the disk routines and integrates them into its regular operating system. The routines to handle specific devices (such as the screen editor, cassette, or printer) now have the ability to handle the disk. (The DOS will go away whenever the Atari is turned off or crashed, incidentally.)

David and Sandy Small, 11314 Yucca Drive, Austin, TX 78750.

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CIRCLE 166 ON READER SERVICE CARD

Atari, continued...

Regrettably, these routines occupy roughly 9000 bytes of memory, so you lose 9K for other uses. You need DOS to access the disk, so if you plan to use the disk at any time during the current power-on session, you must load DOS.SYS. This is something every Atari disk user has done—just turned the machine on, without disk, then tried to access the disk. When I did this last I typed a program in for half an hour, and typed SAVE—nope, couldn't do it.

(If you should get stuck this way, save the program to the cassette recorder, power up with DOS, and reload it from the cassette. The cassette handler is always in memory.)

Now for a little more relevant history. Atari has had several DOSes. The "first" DOS was dated 9/24/79, the date that shows up when DOS is typed. In this version, called DOS 1, the utility functions were integrated along with the regular operating system functions. When a user typed DOS, the utility functions were immediately run from memory, and the DOS menu popped up onscreen.

Well, this wasn't a winner, because these menu functions occupied about 3000 bytes of memory and were only needed when a specific disk utility function was required. DOS 1 also had other problems and bugs, so Atari came out with DOS 2.

In DOS 2 the utility functions occupied a separate file called DUP.SYS. When the user typed DOS, the utility routines were loaded from DUP.SYS off of the disk. They weren't in memory all the time.

There are some minor compatibility problems between DOS 1 and 2. Binary files won't work between them, as DOS 2 has a different "header" format, and copying is a problem.

Fortunately, most of the DOS 1 disks have disappeared, leaving users with an improved operating system which has eliminated many of the bugs. Alas, while Atari was working on the bugs, they "released" several preliminary DOS 2 versions, called DOS 2.4, 2.5, 2.8, and 2.S, all of which have bugs in them. Don't use them.

DOS 2.0S is the most bug-free version. (Should you find an older version of DOS, just re-write the DOS files after powering up from a 2.0S disk.)

One minor problem with the new DOS concerned where to load the DUP.SYS menu package in memory. The way it was set up, a user who went to DOS wiped out the lower 6K of memory, including any programs (such as Basic) stored there. The result? If you had a Basic program, went to DOS, and returned to the cartridge, your Basic program would be gone.

The solution Atari provided was MEM.SAV. MEM.SAV is a special file created from the DOS menu. When you type DOS *and* a file named MEM.SAV exists, then the lower 6K of memory is moved to this file before the utility package (DUP.SYS) is read in. Hence, a copy of the lower 6000 bytes exists on disk. When DOS is left, the MEM.SAV file is read in, restoring memory to what it was. The process can be summed up as follows:

1. User enters a program into memory, including the 3000 bytes "shared" with DOS.
2. User types DOS.
3. Lower 6000 bytes of memory are copied to MEM.SAV on the disk.
4. The utility package (DUP.SYS) is read into the lower 6000 bytes, destroying the program data there.
5. User exits DOS.
6. MEM.SAV is read back in, restoring the lower 6000 bytes, and the user can pick up where he left off.

The process of reading and writing to disk is quite slow, as are all operations with the Atari drives. For this reason I rarely use MEM.SAV; I just save whatever I'm doing to disk first, go to DOS, then recover it from disk later.

Another Sidetrack

Speaking of disk speed, new drives from other manufacturers are becoming available for the Atari. As a general rule, if the drive uses the serial I/O cable to attach to the Atari, it will run as slowly as the Atari disk; this cable is the bottleneck.

When the Atari writes something to disk, it normally re-reads the data written to disk immediately and compares what it finds there with what should have been written. This is a safety feature in case the disk doesn't write correctly. Alas, this slows down the disk drive to one write operation every 1/5 second, a very, very, slow speed. If you wish to cancel this read-after-write process, do this:

1. Power up with DOS 2 into Basic.
2. Type POKE 1913,80
3. Go to DOS and select H: Write DOS files.

The data at location 1913 determines what sort of write the disk drive does: read-after-write (87), or write alone (80). Next time you write to disk, you will notice an immediate increase in the write speed.

In all fairness, I have never once gotten the error message that means the read-after-write failed. Some of my associates have, but only on defective disk drives that gave numerous other errors. In my opinion, the write with no verify is the way to go, as disk operations are quite reliable. The time spent waiting for the Atari to verify data just isn't worth it.

SIZZLE!
Dave Powell

"My God!—I think the Invaders finally wiped out Andy!..."

The DOS Menu

Okay, so we have gone to DOS and are now in the DOS menu. Let's look it over.

The top line identifies the DOS and DOS 2.0S. The S means "single density" and refers to the amount of data written on a particular disk. Atari was going to offer a disk drive called the 815, which was a "double-density dual disk drive." For various depressing reasons the 815 was cancelled, so the double-density operating system, called DOS 2.0D, was never released.

Next, there's the copyright line. Then, the menu options begin. Let's take them in order.

A. Disk Directory: Data on Atari DOS disks is organized into individual files. These files have names of eight characters with an optional three-character extender; e.g. FILE.ABC, PROGRAM.BAS, and so on. Note that I said Atari DOS; there are other disk operating systems available which do not use Atari DOS. For instance, Forth doesn't generally use the Atari DOS at all, and an attempt to read the directory on a Forth disk is usually futile.

The directory is a list of the files, by name, which exist on the disk. Option "A" is used to read this list.

When you press A, the Atari asks, SEARCH SPEC, LIST FILE?

This means you can enter one of two items. The first is a "search specification." You can search for all files, in which case a list of everything on disk is produced, or for a specific group of files. This specific search is accomplished with "wild cards." A wild card is a special character which Atari DOS accepts as "any character." The character "?" is used for a wild card for an individual character, and "*" is used to indicate any characters from that position on. For instance, a search spec of *.* will find all files on the disk. *.BAS will find all files with the extension .BAS. JONES *.* will find any files whose

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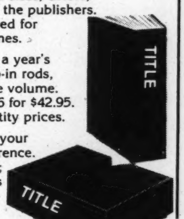

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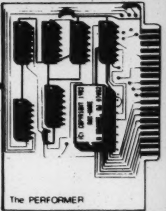

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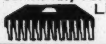

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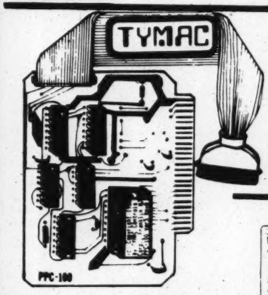

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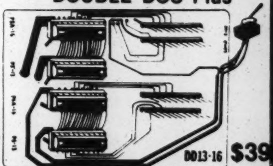

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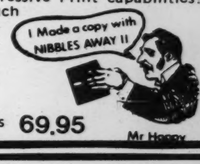
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Atari, continued...

first five characters are JONES. ??XYZ? will find AAXYZJ, ZZXYZD, and A1XYZR.

The second spec tells where to write the directory listing. Leaving it blank means write it to the TV screen, also known as "Device E:" (where the E stands for Editor). Here we get into the I/O system, which we have discussed previously. Devices on the Atari are identified by a letter and a colon. Here is a list of some of them:

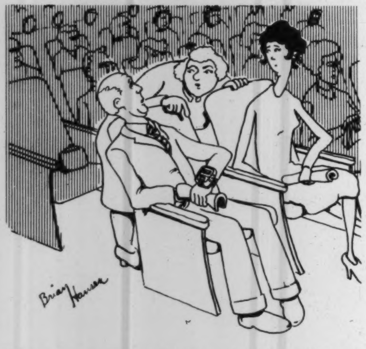
K: Keyboard. Input only.
E: Screen Editor(TV). Input-Output.
S: Screen output. Output only.
C: Cassette unit. I/O.
P: Printer. Output only.
Dn:name.ext Disk drive #n, file name "name.ext."

The directory option asks where you want to write the listing. You can select any of these devices for output but the keyboard (K:).

You could use P: (printer), D:filename (some disk file), and so on. Note the power of the I/O system: you can write the listing anywhere, including devices or file names. For example, writing a listing to a printer is handy for a reference. Writing it to disk might be nice for a directory program. Writing it to the TV is good for quick lookups. This is a powerful unit.

The directory will then proceed. Physically the directory is located in the middle of the disk. This is because the Atari spends so much time looking at the directory that it was felt that the middle would be a good place; it is equidistant from everywhere else, saving lookup time.

B. Run Cartridge. This option transfers control to the plugged-in cartridge. If you don't have one, the Atari will figure it out and let you know it knows. This is how you get back to Basic, the ASM/EDIT cartridge, and others from DOS. Languages which are "disk based" (such as Microsoft Basic) do not use this option. There are different ways of getting to and from DOS using non-cartridge-based languages.



"If your watch says 'beware the ides of March' again I'll call the usher."

C. Copy file. This option allows you to copy from any device or disk file to any other device or disk file. It is extremely powerful.

For instance, if we copy from E:,D:TEST whatever we then type on the screen will be sent to the disk file TEST. (Exit using the Break key.) Bang, an instant crude word processor! We can copy directly from the screen to the printer (E:,P:), from the keyboard to the screen, etc. We can display a file on disk by using D:filename.ext,E:. (This includes Basic files, although they are stored in a crunched format and will look strange when listed.)

Finally, we can copy from disk to disk using this option: D:FROM,D:TO will copy all data in the disk file FROM to the file TO. Also, we can copy from disk to disk: D1:FROM,D2:TO will copy from FROM on disk #1 to TO on disk #2. The Atari can support up to four disk drives, D1-D4. The drive is identified by the two switches in the back of the disk unit; they can be set in four positions, and the position in which they are set determines the drive number of the disk.

Another short detour: If you can't get your system to "wake up," check these switches. The Atari will be looking for the disk #1 to get DOS.SYS from, and if no disk currently online has its switches set to 1, the Atari won't find it. This leads to all sorts of strange things. So especially if you have a multi-disk system, check this if you get weird errors.

You cannot use the Copy option on a single disk system to transfer files between separate diskettes. Use the 0 option to do this. 0 reads the entire file into memory then prompts you to change diskettes. Then, it writes the file out to disk.

COPY uses as much memory as possible as an intermediate storage place. If you copy a disk file to the screen, you will note that the entire file is read off disk before it begins copying to the screen. This is the nature of Atari I/O. You will also see that when copying to the printer, you must terminate the input operation before the output begins.

This causes a problem when MEM.SAV is used. When MEM.SAV is active, the Atari assumes that all memory outside the 6K bytes copied on disk is inviolate. On a copy, it will ask you whether to use the rest of memory to speed things up.

If you don't you will have a very slow copy, as only a small intermediate area in memory can be used. This also keeps memory intact for you to return to after you're done with DOS. Should you elect to allow Copy to use the rest of memory, MEM.SAV is invalidated and you lose whatever is on disk. The choice is yours. (The Atari will warn you that a "Yes" to its prompt will invalidate MEM.SAV.)

Warning: Files with ".SYS" as the extension will not copy using the wildcard options. While this doesn't really matter with DOS or DUP.SYS, as they may be written with the H option, it is critical with AUTORUN.SYS files. Be sure to force a copy of the AUTORUN.SYS file if you copy a disk this way.

D. Delete File. This is an option to allow you to delete a file from disk. If you use a wildcard, you can get rid of a whole group of files. For example, to delete every file with an extension .ASM, use: *.ASM at the prompt.

Delete will ask you if you wish to delete each individual file by printing the file name, then asking DELETE? Y/N. If you don't want it to verify that you want the file deleted, add a /N at the end of the file specification. For instance, to delete all files with SAM as the first three characters and not get a prompt, use SAM*.*/N. The DOS will then delete everything it finds with those specifications without asking again if you really want to do it.

Delete *.*/N will erase an entire disk.

E. Rename file. This option allows you to rename a disk file. You enter the first file name, then the second. HERMAN, FRED will rename HERMAN to FRED on disk. Wild cards can also be used, but be careful.

This option also allows you to create two files with the same name—a significant problem. If you try to access the file by its name, the first occurrence will get priority, and you will have lost the second file for all practical purposes. But delete or rename will get both occurrences of the file, alas. What to do?

Try this. Turn up the TV sound. Rename the file something else, and listen. Immediately after hearing the first clunk of a disk write (not a beep, that's a disk read), pop the drive door open. This will prevent the Atari from renaming the second file, which would be the second clunk. Do this at your own risk—you could also trash the directory and lose the disk if your timing is wrong.

An alternative is to use a Disk Fixer program, such as the one available from APX, to alter the directory.

That's all we have room for this month. Next month we'll finish discussing the DOS menu options and have a few surprises.

Correction

There were two lines missing in the GTIA demonstration programs that appeared in the June, 1982 column (LOGO, HYPNO, ESCAPE, MELONS, SAS, and WHIRL).

31000 DATA 104, 162, 0, 172, 193, 2, 189, 194, 2, 157, 193, 2, 232, 224, 8, 144, 245, 140, 200

31010 DATA 2, 96, 65, 65, 65, 65, 65, 65 ☐

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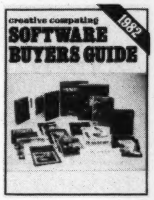

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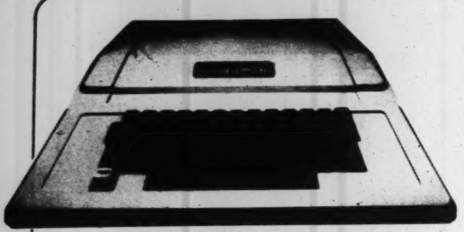

le cart...apple cart...apple

Chuck Carpenter

These past few months have been quite hectic here. We have launched (with a lot of O.T.) several new versions of our products at work. And, by the time you read this, we (the Carpenters) will be in our new home. Many of you readers have continued to send me your one-liners and other programming ideas.

It's always interesting to discuss a programming technique in the column. The responses often include new and sometimes easier ideas for doing the same thing. As always, the one-liners and other responses will be included in the column as appropriate. Questions and answers about Apple things are included too. This month the questions and answers will include the use of the 2716 EPROM in the Apple. Also included are some interesting one-liners and other tid-bits from my Apple Cart file.

Tid-Bits

In the April '82 column, I mentioned that you could use the old and new monitor ROMs in your Apple but I couldn't remember where the info was published. Two readers wrote to remind me: Frank Kuechmann who had seen the info in *Softalk*, and David Holden who had seen it in *Call A.P.P.L.E.* Look on page 184 for the article in the Dec. '81 issue of *Softalk*. In *Call A.P.P.L.E.* the information appeared on page 47 of the July-August 1980 issue.

David Holden also commented on my review of the Videx Videoterm 80-character board in the April '82 issue. My review stated that the ability to use the shift-key arrangement with the Super-Text word processor would be nice. Well I could have done just that but missed the technique in the Videx manual. David found the way on pages 4-14 and 4-15.

And it works! I am using Super-Text II, the version that will boot from either DOS 3.2 or 3.3. Recently, the newest version of Super-Text (including all sorts of new goodies) arrived for me to review. I'll be doing the review in a future column.

Here's a useful memory (human) aid from Raymond Schuerger. He finds that during extended programming sessions the name of the current program escapes him. To help keep the records straight, he uses this routine:

63332 END
63333 D$=CHR$(13)CHR$(4) : PRINT D$; "SAVE filename"

Whenever it is time to save the current version, simply RUN 63333. The program with the name "filename" is saved to the disk for you.

One-Liners

Listing 1 is a routine that helps you balance your checkbook. Donald Steel sent this one to me. He points out that the 64600 call is HOME, the call to 64484 is the BELL and the 64668 call clears to the end of the line.

Two other one-liners were sent to me by Peter Lachenbruch. The first one, Listing 2, does a Simpson's rule integration. (None of the math books I have defined it.) It should be useful to those of you with mathematical inclinations. The second one, in Listing 3, draws random spirals, with different distortion factors.

Listing 1.

```
1  CALL 64600 - Q: VTAB 1: HTAB 1
   5: INVERSE : PRINT "GS ADD U
   P": NORMAL :V =  INT ((L - 1
   ) / 40): VTAB V + 3: HTAB L -
   40 * V + 1:L = L + 10: INPUT
   "";A$:A =  VAL (A$):Q = 116:
    IF A <  > 0 THEN  VTAB 23: HTAB
   20: CALL 64668: INVERSE :N =
   N + 1:T = T + A: PRINT N;: HTAB
   24: PRINT T;: GOTO 1
```

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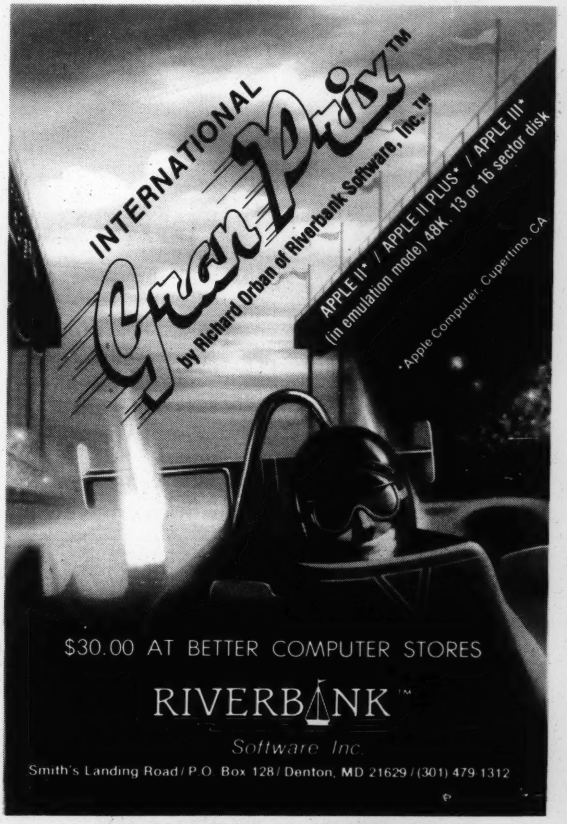
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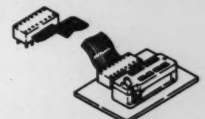

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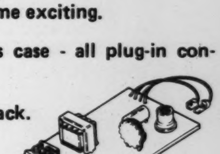

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CIRCLE 167 ON READER SERVICE CARD

Apple, continued...

The final one-line routine for this month comes from Robert Vogel. This Applesoft routine (Listing 4) is a high resolution dump that generates a bar-chart of the Apple memory while displaying relevant values below. If the print statements are removed, the program will run faster, but the control-s pause will no longer work.

One-Pagers

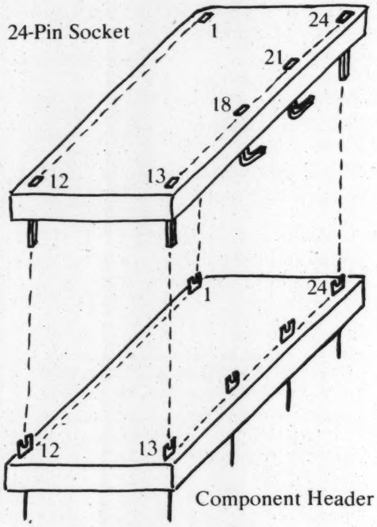
The short programs included in Listings 5 and 6 were sent by Ragnar Fryi from Asker, Norway. The first one is a program to switch from a hi-res page to a lo-res page. Ragnar indicated that this was not supposed to be easy to do. This little routine does the job and is interesting to use. The other routine from Ragnar is also interesting; it makes a billboard display out of a text string. Other similar routines have been included in this column in the past. This one has some unique features including forward and backward display.

Questions and Answers

One reader (whose name escapes me now) asked if it were possible to use the 2716 EPROM (or the equivalent 2516) in the Apple II. The answer is yes, with an adapter. Since there are two unused sockets in machines with Integer Basic, it is often useful to put some of your own machine language routines in this memory space. The addresses of these two sockets start at $D000 and $D800. You can include up to 4K of programs in these two sockets.

Note that these same two sockets are available on the Integer Basic firmware board too. To make an adapter, you need a 24-pin IC socket and a 24-pin component header. Figure 1 shows how to make the connections. You could also just bend the pins up on the 2716 and solder a connection to the appropriate pins. This is more risky but doesn't require the extra components. I have done it both ways with equal success.

Figure 1. 2716 Adapter.



Carefully bend-up pins 18 and 24 at the socket. Connect pin 18 to pin 12. Connect pin 21 to pin 24. Then solder all the remaining pins in a one for one correspondence from the socket to the header. Do not connect socket pins 18 and 21 to the header.

Listing 2.

```
10 DEFFNF(X)=X∧2:INPUT"A(<), B AND N"; A,B,N:H=(B-A)/N; VA=0: V=A:
   FOR I=1 TO N=1 STEP2:  V=V+2*H:  VA=VA+4*FNF(V-H)+2* FNF(V):  NEXT:
   VA=H*(VA+FNF(A)-FNF(B))/3: PRINT "INTEGRAL="; VA: GO TO 10
```

Listing 3.

```
100 A=RND(1):B=RND(1):PI=3.13159=HOME:HGR:HCOLOR=INT(RND(1)*7):HPLOT140,80:
    FOR R=0 TO 10*PI: X=A*2*R*COS(R)+140:Y=B*2*R*SIN(R)+80;HPLOT TO X,Y:
    NEXT:GO TO 100
```

Listing 4.

```
100 REM * HI-RES MEMORY DUMP *
150 REM - BY ROBERT VOGEL -
175 REM
200 HGR : VTAB 23: PRINT "0"; TAB(
36);"256": HCOLOR= 3:J = 0: FOR
X = X TO X + 159:J = J + 1: VTAB
21: PRINT "MEMORY LOCATION=
";X; TAB( 25);"VALUE= "; PEEK
(X); TAB( 25);"    ": HPLOT 0
,J TO PEEK(X),J: NEXT : GOTO
200
```

Listing 5.

```
5  REM  HIRES/LORES PAGE SWITCHER

6  REM  BY:  RAGNAR FRYI
7  REM       ASKER, NORWAY
10  HOME
20  VTAB 12: HTAB 12: PRINT "TEST
     PAGE"
30  HGR : HCOLOR= 3
40  HPLOT 0,0 TO 279,0 TO 279,159
     TO 0,159 TO 0,0
50  POKE 49239,0: REM  SET HIRES/
     LORES SWITCH TO HIRES
60  POKE 49232,0: POKE 49233,0: GOTO
     60: REM    THROW TEXT/GRAPHI
     CS SWITCH BACK AND FORTH AD
     NAUSEAM
```

Listing 6.

```
5  REM  BILLBOARD DISPLAY ROUTINE

6  REM  BY:  RAGNAR FRYI
7  REM       ASKER, NORWAY
8 :
10  LET Q = 1: HOME
15  PRINT "TYPE A MESSAGE FOR DIS
     PLAY ": INPUT ST$
20  HOME :L =  LEN (ST$)
25  VTAB 10
30  PRINT  LEFT$ (ST$,40)
35 B = B + Q
36  IF ( ABS (B) > 100) THEN Q =
     - Q
40  ON (B > 0) + 1 GOSUB 100,200
45  FOR C = 1 TO 200: NEXT
50  GOTO 25
60 :
90  REM  FORWARD
100 :
110 ST$ =  RIGHT$ (ST$,1) +  LEFT$
     (ST$,L - 1)
120  RETURN
140 :
150  REM  BACKWARDS
160 :
200 ST$ =  RIGHT$ (ST$,L - 1) +  LEFT$
     (ST$,1)
210  RETURN
```

Fast Hex/Decimal

In the May '82 issue, a tutorial on converting Hex to Decimal and the other way around was included. Tom Hodgdon has sent in a machine language program that does the job faster. The program, shown in Listings 7 and 8, is the hex/decimal program. Listing 7 is an Apple II disassembly and Listing 8 is a hex memory dump of the same program. To use the program, do the following:

1. Enter the program from the monitor using the hex memory dump. The technique is described on page 44 of the Reference Manual.
2. Type BSAVE CONVERTER, A768,L79
3. Once saved, type BRUN CONVERTER

Now, to go from hex to decimal type:

&D(hex number to be converted)

To go from decimal to hex, put an H where the D was in the example above.

Once loaded, the program is there until you turn off power or reboot a disk. If you do either, you will have to load the program into memory again. Now if Tom had sent along a description of how the program works, that could have been included here too.

Listing 7. Apple disassembly of the hex to decimal conversion program.

```
*300LL

0300-   A9 4C       LDA   #$4C
0302-   A2 10       LDX   #$10
0304-   A0 03       LDY   #$03
0306-   8D F5 03    STA   $03F5
0309-   8E F6 03    STX   $03F6
030C-   8C F7 03    STY   $03F7
030F-   60          RTS
0310-   AA          TAX
0311-   F0 38       BEQ   $034B
0313-   20 B1 00    JSR   $00B1
0316-   E0 44       CPX   #$44
0318-   F0 0F       BEQ   $0329
031A-   E0 48       CPX   #$48
031C-   D0 F2       BNE   $0310
031E-   20 67 DD    JSR   $DD67
0321-   20 52 E7    JSR   $E752
0324-   A6 50       LDX   $50
0326-   4C 41 F9    JMP   $F941
0329-   A2 00       LDX   #$00
032B-   86 9E       STX   $9E
032D-   86 9F       STX   $9F
032F-   C9 3A       CMP   #$3A
0331-   90 02       BCC   $0335
0333-   E9 07       SBC   #$07
0335-   0A          ASL
0336-   0A          ASL
0337-   0A          ASL
0338-   0A          ASL
0339-   A2 03       LDX   #$03
033B-   0A          ASL
033C-   26 9F       ROL   $9F
033E-   26 9E       ROL   $9E
0340-   CA          DEX
0341-   10 F8       BPL   $033B
0343-   20 B1 00    JSR   $00B1
0346-   D0 E7       BNE   $032F
0348-   4C 28 ED    JMP   $ED28
034B-   4C 03 E0    JMP   $E003
034E-   00          BRK
034F-   00          BRK
*
```

If You Write

As I mentioned before, write to me if you are inclined to. I enjoy receiving your letters and responding. It has been my pleasure to have helped several hundred readers who have written to me over the past couple of years. Please include a self-addressed stamped envelope (SASE) for a speedy reply. My new address is: 3714 Bishop Hill Rd., Carrollton, TX 75007.

Next Time

The March '82 column contained Pascal information. The responses to the item about printing with Pascal will be included in the next column. ☐

Listing 8. Hex dump of the program in Listing 7.

```
*300.34E

0300- A9 4C A2 10 A0 03 8D F5
0308- 03 8E F6 03 8C F7 03 60
0310- AA F0 38 20 B1 00 E0 44
0318- F0 0F E0 48 D0 F2 20 67
0320- DD 20 52 E7 A6 50 4C 41
0328- F9 A2 00 86 9E 86 9F C9
0330- 3A 90 02 E9 07 0A 0A 0A
0338- 0A A2 03 0A 26 9F 26 9E
0340- CA 10 F8 20 B1 00 D0 E7
0348- 4C 28 ED 4C 03 E0 00
```

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CIRCLE 192 ON READER SERVICE CARD

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Will Fastie

This past month has been a busy one for both me and the IBM Personal Computer. My stack of press releases has never been higher; I just wish I had the space to mention them all. My stack of software for review is mounting too, but that's nice. Now I'll be able to pick and choose, so I'll have a little more fun, and I can comment on the more interesting things here.

I think the most interesting event this past month is the discovery of the first "major" bug in Basic. It's not the bug that's interesting, though, but the reaction to the bug. In fact, the bug is rather obscure, and I agree with the assessment made by Bill Gates at Microsoft that few, if any, programs would be affected by it.

No, what makes this interesting is the attention the news media paid to the bug. *The New York Times* carried the story near the front. *The Wall Street Journal* even ran a note.

What's my point? Simply that this is far from the first bug ever found, even in something as robust as Microsoft Basic. So why all the fuss? Did *The New York Times* ever publish a bug found in an Apple? I doubt it. There is only one thing that makes this relatively minor problem remotely newsworthy, and that's the name on the front of the computer.

I like to take potshots at the big guys too, but I think the reporting in this case was a little extreme. *The Wall Street Journal* seemed to have done some reasonable research, including calling me for backup information, and at least their note was small and well back in the paper. Still, I don't think any of the reporters really had a sense of the magnitude of the problem. *The Wall Street Journal* did ask me about that, to their credit. What surprises me is that this rather minor bug got quite a bit of play while none of the other problems have been mentioned.

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Online

The big news this month is that I've gone online: I am now a subscriber to The Source. I'll be saying more about The Source as time goes on, but here's a brief description for those of you who don't know what it is.

The Source is a service of Source Telecomputing Corporation, a subsidiary of The Reader's Digest Association, Inc. The Source refers to itself as "America's Information Utility," and with 1200 services and programs available online, might very well be.

There are all kinds of information sets on a broad range of topics. You can get airline schedules, buy tickets, check restaurants in the Mobil restaurant guide, get advice on buying wine, read the news, play games, or balance your checkbook. The Source is also an electronic mail service, the very thing I'm after.

With its various communications services, The Source provides the opportunity to reach a large number of people with your views or questions, and to hear the views and ideas of others. The system provides the means to find users with similar interests and to carry on electronic conversations of various kinds. And that's why I've subscribed.

Frankly, I'm experimenting to see if this service can provide an effective information gathering resource. Toward that end I am publishing my account number here (see below), and I welcome your mail via The Source.

I've only had a little time on the system

The Bug

The bug that caught everyone's eye is really obscure. It is quickly seen when the following statement is entered for direct execution, that is, without a line number:

```
PRINT .10#/10
```

Basic replies .001, which is of course wrong by one order of magnitude. However,

```
PRINT .1#/10
```

gives the correct answer of .01, as does

```
PRINT USING "#####.#####",
.10#/10
```

In fact, the PRINT USING version is the form IBM has suggested to "work around" the problem.

The problem is very hard to find. The sequence

```
A# = .10#
PRINT A#/10
```

produces the correct answer. I spent some time trying to force other instances of the bug, but I could find none. It appears that it only manifests itself with constants and not variables. This leads me to believe that the suggestion by IBM that the bug is limited to the PRINT conversion process and not to the internal representation of the value is not quite accurate.

In these examples, the number sign following the fraction forces Basic to consider the number double precision.

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IBM, continued...

to date. First sessions are always a bit tricky, but I've started to get the feel of the thing. A couple of more flights and I'll be ready to solo.

Communications

In order to get to The Source, another service, or just your friend with another computer, you'll need some equipment and some software. Here's a little primer that might help.

First, you need a telephone. If you haven't got one, you're not very communicative anyway. The phone set does not have to be special in any way.

Next, you need a modem. "Modem" is a compression of the phrase "modulator-demodulator." This device translates digital signals from the computer system into signals that can be transmitted across the telephone line, and also translates the other way. For our purposes, there are two kinds of modems of interest.

The first is the well-known acoustic coupler. This device is designed to cradle the handset of the phone, and transmits and receives data from it, just as if the machines were talking audibly.

The second modem type is called direct-connect, because it attaches directly to the telephone line. To use a direct-connect modem, you need a phone with the newer modular jack, the little clear plastic one.

Next, you need a device to connect the modem and the IBM PC. IBM sells such a device, called the Asynchronous Communications Adapter, for $150. Other such devices, also called serial ports or RS-232 ports, are now available from other manufacturers. This device allows the computer to transmit data in serial form, that is, one bit at a time, to another computer, a terminal, or a modem.

Finally, you need a piece of software. What this software does is administer the transfer of data to and from your computer. In the case of The Source, the software must make your computer look like a simple terminal.

This means that characters must be received from the port and displayed on the screen, and that characters typed by you at the keyboard must be transmitted to the device to which you are trying to talk.

The software program required to make the IBM PC a dumb terminal is relatively simple, and in fact one of the demonstration programs on the IBM DOS disk is called "COMM.BAS" and serves this exact purpose.

Depending upon who supplies you with all this stuff, you may need one more thing. A data cable must connect the serial port of the computer to the modem. I built my own.

You need two DB-25 connectors, one male and one female, and three to six feet of cable, determined by your personal requirements. The cable must have at least 10 wires. I wired pins 1 through 8, 20, and 22 straight through, which means pin 1 on the male side to pin 1 on the female side, and so on. Although I have heard that some special wiring should be done for certain modems, I have had no trouble using the IBM adapter and the Hayes Smartmodem.

Modems

There are many modems on the market, and you'll have to choose one that meets your particular requirements. Usually the cheapest modems are acoustic couplers, and the most visible products in this class are the Novation Cat ($189) and the Radio Shack Telephone Interface II ($199).

The next step up is a simple direct-connect modem. There are three that spring to mind. The first is the Universal Data Systems (UDS) Model 103 LP ($195). This is the device that is sold in IBM Product Centers.

The UDS 103 is nice because it is "line powered," which means that you don't need to plug it in. It takes its power from the telephone line. It is specifically designed to allow the telephone to sit on its top. A switch on the front allows the set to be switched between voice and data modes, so the modem never has to be disconnected. Two other modems in this class are the D-Cat from Novation ($199) and the Direct-Connect Modem I from Radio Shack ($149).

At the top of the heap are the intelligent direct-connect modems. There are four that I know of, including the Radio Shack Direct-Connect Modem II ($249), the Novation Auto-Cat ($250), the UDS 103 JLP ($245) and the Hayes Smartmodem ($279). What these modems offer is the ability to dial and answer the telephone automatically, which means they can be used unattended.

The only one of these devices I've actually tried is the Smartmodem. Hayes has a fabulous reputation, and I must say I do like the Smartmodem. With a little additional programming in the COMM.BAS program, I should be able to log onto The Source with the push of a single button.

The Smartmodem also talks back. There is a computer in that box that responds (in English, if you like) to your commands. In the case of logging onto The Source, first you have a short dialog with Smartmodem, which will include a command to tell it to stop acting like a computer and start acting like a modem.

Before that, however, you can tell it everything imaginable about how it should behave as a modem, like whether to dial the phone using pulses or touch tones, how many rings to take before answering, under what conditions the integral speaker should be on, how long to wait for the dial tone before aborting, how long to wait before hanging up if the connection seems lost, and how long each touch tone should be. And more.

One more thing. I've been talking to a number of people developing software for the IBM PC. Many have said that they are writing their programs specifically to take advantage of the Hayes equipment because of its features. Although I can't say anything negative about any of the other equipment I've mentioned, it certainly appears that Hayes has an edge.

Last of all, a very important warning. You will hear about "originate," "answer only," and "originate/answer" modems. It is worth the few extra dollars, if any, to have an originate/answer modem. When you communicate with another system, one system must originate and the other must answer. Having both modes simply gives you the greatest possible flexibility. The UDS 103 sold in the IBM Product Centers has both modes, as does the Smartmodem. I think most of the devices I've mentioned do, but check.

Onward and Upward

I haven't been shy about speculating on numbers of IBM PCs that will be sold. However, I'm no market expert. I've begun to do a little research.

I talked with Barry Gilbert, product

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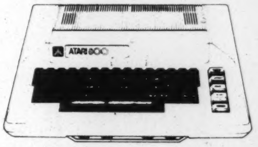

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IBM, continued...

manager of the Corporate Planning Service for International Data Corporation, a highly respected research company. Although I couldn't coax forecasts for 1982 out of IDC, Barry did tell me that they believe 35,000 systems were installed by the end of 1981, 100 of those outside the United States.

IDC feels that about 40% of the systems are being sold through the retail distribution channel, while the other 60% are sold by IBM's direct sales force. IDC estimates the average selling price for the IBM PC to be $5055, which means that the vast majority of these systems are configured on the bigger side.

From a variety of sources I've collected some rumors, guesses, and unofficial forecasts. International distribution of the PC is put sometime in the third quarter of this year, with 20% of all sales going overseas. IBM will announce other retail distribution channels. IBM is considering their own very large retail network, and is already planning to expand their Product Centers to 50 units.

And of course, the copies are coming. It appears that IBM will have competition from the Japanese in particular with look-alike units. Fortune is also out now, and their 32:16 system based on the 68000 processor will combine with the Radio Shack Model 16 to really heat up the competition. Lisa, from Apple, is lurking somewhere too. Somehow, I think IBM will do okay.

Games

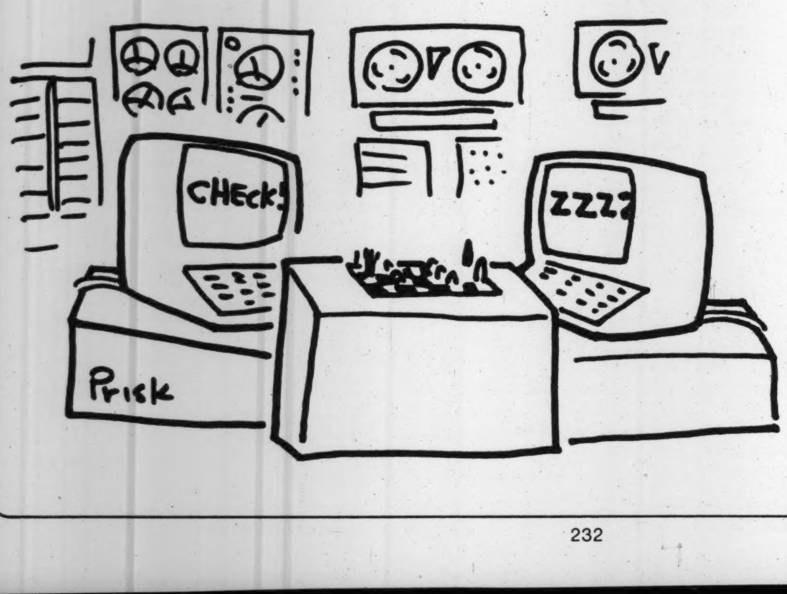
Of course, I'm going crazy waiting for some games. *Pac-Man* for my Atari game machine is currently filling the void, but my son hogs it. I finally got a game for the PC called *Space Guardian*, from Omric Corporation. This game works on my 80-column display, and turns out to be a variation of the Star Trek game published several years ago in *Byte*. I've played it briefly, and it's okay. The display is built out of the graphics character set, and it's a reasonable job. There are a few misspellings in some of the text that is displayed, and that has a tendency to make the program seem less professional. A minor problem is that once a command has been issued, there is no way to change your mind. The price is $29.95.

I give Omric excellent marks on their manual. It is complete, clear, and well produced. It contains everything you need to know to get started, including likely problems that might occur. Step-by-step instructions for setting up the disk are clear, and the game instructions are well done. The document is typeset and has a nice cover, done in color. There is a complete table of contents.

I have noticed that the IBM PC seems to be bringing out the best in software authors. I'll describe another manual a little later, but in general I've been impressed with the quality of documentation provided with most PC software at which I have looked. This is a very good sign, and I hope you budding authors will take heed.

The two other games I know about are also space games. One is called *Star Trek* (guess what this one's about) from Zeta Products ($24.95). The other is called *Galaxy Master* from Info-Pros ($29.95). I haven't the slightest idea what either game is like.

Another development for games is the announcement of joysticks and game paddles from Kraft Systems, Inc. Kraft has made joysticks for hobby radio control systems in the past. TG Products, which has been selling joysticks for the Apple II, also has an IBM stick. I don't have any information on either of these products yet. TG sells a lot of Apple joysticks, and has a good reputation.



A Note on the IBM Assembler

After some delay, the IBM Assembler seems to be in good supply. This was a relief to me, since I wanted it for some work I am doing. I've since discovered something of which you should be aware if you are considering purchasing the product.

The assembler package includes two versions of the assembler. One, called the Small Assembler, is used in systems with 64K of memory. The other, called the Macro Assembler, requires 96K.

My friend Rich told me that he has constructed a relatively small program, and that the assembler was unable to complete the assembly. Somewhere during the second pass the program indicated that it was out of free memory. Rich has a 64K system and was running the Small Assembler.

The next day, another source confirmed this situation, saying that the assembler could "only assemble toy programs." This is a disappointment. The program for which I was planning to use the assembler is somewhat large, and now, with only 64K to my name, I'm in trouble.

I think IBM is not being entirely fair when they claim 64K for the Small Assembler. It is apparent that a system to be used for program development must have 128K, the amount required for Fortran, Pascal, and perhaps the assembler.

A Note on Hard Disks

Although I have mentioned the existence of hard disks in this column, I have said little more. There are a few points to keep in mind if you are considering such a purchase.

First, will you be able to get the unit serviced? These small Winchester drives typically have a very long duty cycle and require no preventive maintenance, but something can always go wrong. Consider the options carefully before you buy a disk through the mail. The local computer store may agree to service your disk, but they probably will not (at least not for a reasonable fee) if it is not one they normally stock and sell.

Second, how will you provide backup for the disk data? Some of the ads say "30 times the storage of a floppy." Will you copy the data to 30 floppy disks after each session? Some of the disk subsystems have a built-in backup facility. If the one you are considering does not, you must consider the logistics of your situation and buy accordingly.

Finally, the IBM software does not support a hard disk. How will you make the disk run in your environment? The only answer is that the disk supplier must provide the necessary programs to allow proper disk access.

A hard disk is a big purchase. Be sure you consider it carefully.

Software Mini-Reviews

Two of the software packages that I have received recently deserve special mention. They are the *Volkswriter* word processor, and a clever program called the *Floppy Disk Librarian*.

Volkswriter, from Lifetree Software, is what I call an entry level word processor. It is not as fully featured as (heaven forbid) *EasyWriter*, but it redeems itself in several ways. Perhaps the most important fact is that although *Volkswriter* is really a word processor, it can also be used as a program or file editor.

Usually, there is a distinct separation between editors and word processors. Editors often can't format the text when it is modified, and word processors always seem to want to stick non-printing control information in the middle of the text. With *Volkswriter* and a little self-discipline, you can have both kinds of text processing in one package. That's a money saver.

Volkswriter has four important characteristics in light of the embarrassment of *EasyWriter*. First, it works reliably. I was always nervous with *EasyWriter*, and justifiably so considering the number of times I got zapped. I've had no worries with *Volkswriter*.

Second, it is very fast. The performance of the program, which is written in IBM Pascal, really makes a tremendous difference during an edit. I have never been able to get ahead of the program, no matter what I did.

Third, the program uses standard DOS files, and because it keeps the files in text format without embedded control information, it can both read and write files for interchange with other programs. Finally, *VW* (the name under which it is invoked) knows how to manage the printer properly.

The version I have been using, and with which I prepared this column among other things, is the first released version. It lacks a few features which I think are important. For one thing, *Volkswriter* cannot do headers or footers. I find this feature very useful in the preparation of manuscripts because it lets me identify each page absolutely. Camilo Wilson, the president of Lifetree, told me the feature was planned for a future revision.

Another missing feature, trivial but helpful, is word counting. When I do this column I have a target number which I'm supposed to be near, and many writers are simply told "Give me 1000 words on..." I shouldn't call this a missing feature, because *Easywriter* is the only word processor I know that has it. One cursor movement function is missing, and that's the one that allows movement to the beginning or end of a line.

One excellent aspect of the package is the tutorial. It is not contained in the manual, but comes on the disk. The manual explains how to get started, and then turns you over to the disk. The tutorial explains the basics of *Volkswriter*, and lets you try everything that's explained. This is a terrific idea. I got rolling very quickly, faster than I ever have before. Attention has also been paid to the human factors. The program takes very good care of its user, and definitely will err on the side of caution.

The price of *Volkswriter* is $195, and I think it's worth it. The program requires a 64K system, at least one disk, and an 80-column display. For larger documents or manuscripts, 128K is strongly recommended.

The second software package is *Floppy Disk Librarian* from Little Bit. I have experimented with this program only briefly, to verify that it worked as advertised. However, it is an excellent concept and seems to be well implemented.

The concept is simple. Once the program is running, you insert a diskette in a free drive. Giving the command CATALOG causes the *Librarian* to read the directory of the disk and add the information to its master directory, along with whatever other information has been collected from other disks. Each disk is named by storing the name in a file called NAME-OF.DSK. Comments can be added to each entry in the *Librarian*.

And voila! The result is a centralized list of all your files and disks which can be examined at the display or printed as a report. The report lists all files alphabetically, as well as each disk and its contents. For each file, the report also shows the name of the disk upon which it resides, and the comments.

The manual for this system is also well done. It is not typeset like the one for *Space Guardian*, but the content is good. The only objection I had was that it assumed too much. For example, it shows each command ending with Enter. Now I know metalanguage when I see it, but will the average user? This is not a severe criticism, but document writers must learn to consider the audience more carefully.

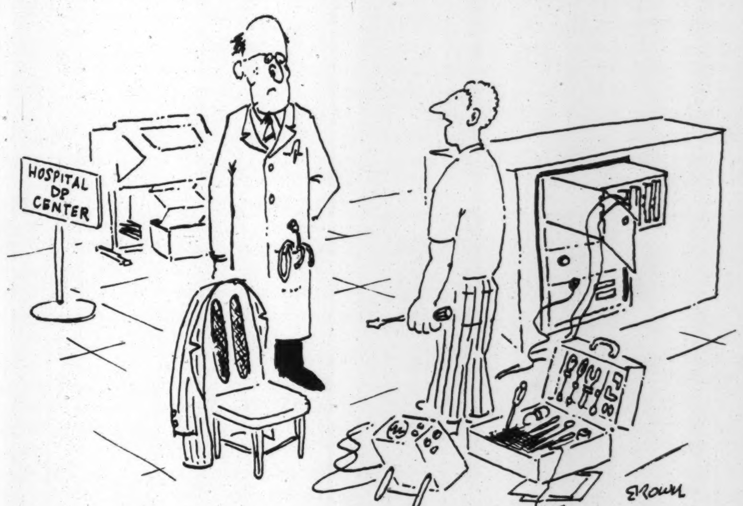
The program requires a 64K system and at least one disk. It can store 320 entries on a 64K system, and 740 on a 96K system. The manual does not specify if there is an upper limit to the amount of useful memory. The package costs $39.95.

New Products—From IBM

The hot news here is from IBM. This month several new programs were announced, and best of all, they were available immediately. My local Computerland (and my local IBM Product Center, of course) had all the announced programs on the day of the announcement. I was much impressed by the tremendous improvement over previous IBM software releases. I even had review copies within two weeks! Much better, IBM. I hope this becomes the norm.

CP/M-86 was finally officially announced. The price is $240 and includes an editor, assembler, linker, and debugger. Minimum system requirements are 32K and one disk. The assembler requires 64K.

IBM announced the IBM Personal Computer Cobol Compiler, by Microsoft. The language supported is ANSI X3.23 1974. The compiler requires two diskette drives and 64K of memory. IBM recom-



"Your real time clock has the twenty-four hour flu."

mends an 80-column display. The price is $700.

A fourth module from Peachtree Software was announced. It is *Inventory Control*, and it can be used alone or with the other Peachtree packages. The program costs $595 and requires a 64K system with two disk drives, 80-column display, and printer.

The *Dow Jones Reporter* is a program that allows the IBM PC user to access the Dow Jones services. These include news from *The Wall Street Journal* and *Barrons*, as well as the Dow Jones wire service, current day quotes, historical stock information, and other financial information. A single disk, 64K system is required for the $100 package. (I have heard, but have not yet confirmed, that this program is slower and less powerful than the version in use on Apples. One reader told me that he spent twice as much time online with his IBM as he had with his Apple, for the same amount of work. Also, even though he already had a Dow Jones account, he had to pay for it all over again when he paid for the IBM software.)

Microsoft's *Time Manager* was also announced. This program can keep a calender, maintain a "to-do" list, prioritize the data, and keep track of income, hours worked, and expenses. The program costs $100 and requires a 64K system with one diskette drive.

New Products—From Others

For those of you who are disappointed that I have not yet published a screen dump program, take heart. There are two programs already on the market. One is called *Grafprint* from PC Products ($49.95) and the other is *Videograph 88* from Windmill Software ($59.95). My local Computerland carries *Grafprint*, and Windmill claims their product is also carried through the Computerland network. Since I am still without Graftrax, I have not had an opportunity to test either package. I'll let you know how they are as soon as I can.

A product called *The Personal Investor* has been announced by PBL Corporation. This product is a direct competitor to the IBM Dow Jones package and performs a similar function. The $145 program requires a 128K PC, one disk drive, any display device, a communications adapter, and a printer. The price of this program does not include the subscription to Dow Jones. The documentation for the package looks good.

CompuView Products has released their popular *Vedit* full screen editor for the Personal Computer. The price is $195. CompuView is also selling a CP/M-86 for $325, and *Vedit* can be had for $100 if purchased with CP/M. CompuView's CP/M-86 predated the IBM version by several months and has a slightly different set of features, including hard disk support.

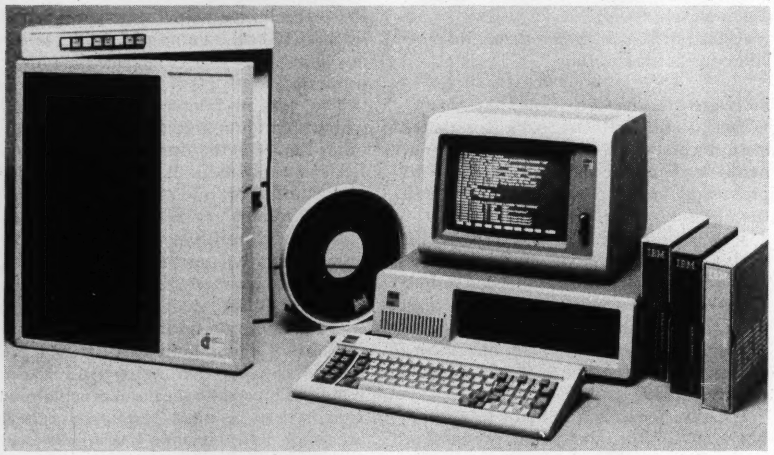


Photo 2. The GPIB-1050 from Innovative Data Technology provides industry-standard magnetic tape capability to the IBM Personal Computer.

School Daze is a unit of measure conversion program from Metamorphics, Inc. Besides the standard English to Metric conversions, the program can answer very strange questions, like how many gills are in a hogshead. $25.

WordStar for the IBM was released to dealers in demonstration form. The consumer package will be available "soon" (by the time you read this, I'm sure) at a price of $495.

NEC Information Systems, Inc., has announced a letter-quality printer for the PC. It is the Spinwriter model 3550 with a parallel printer port and operates at 35 cps. The suggested price is $2250.

The Computer Case Company has recently added a line of cases for the Personal Computer. The system unit, keyboard, and manuals will fit in the IB501 case ($129), the IB502 case holds the Monochrome Display ($99), and the P403 case holds the printer ($89). The cases have hard sides, padded handles, and locks. The cases are shown in Photo 1.

Photo 1. Hard shell cases for the IBM Personal Computer from Computer Case Company.

Although you might not think industry standard, 1/2", 9-track magnetic tape transports are the kind of peripherals desired by the average IBM PC owner, Innovative Data Technology must believe they have a market niche. They have introduced the GPIB-1050 Tape Transport which can handle reels of tape up to 2400' in length, records at either 800 or 1600 bpi, and operates at a speed of 45 ips. The transport is shown in Photo 2.

IDT has also announced the GPIB-3000, a 1/4" tape cartridge subsystem. Using DC 300 XL cartridges, the subsystem can store 3.35 megabytes of data. Either subsystem is supplied with a single board controller, which requires one expansion slot in the system unit; cables; documentation; and a software driver. Prices range from $3750 to $8500 depending on configuration.

Xedex has announced a new package option for their Baby Blue CPU+. The combination of the CPU+, *WordStar*, and *MailMerge* is being offered for $980. According to Xedex, this represents a savings of $195, since the software normally costs $575 and Baby Blue alone lists for $600. Xedex also points out that their version of *WordStar* will recognize the special function keys on the IBM keyboard as well as the standard *WordStar* control sequences. As I understand it, Micropro's version of *WordStar* for the IBM Personal will not support the IBM keyboard very well.

Sorcim has announced *Supercalc* for the IBM PC. *Supercalc* is an excellent spin-off of *VisiCalc*, originally produced for the CP/M market. The PC version supports memory beyond the 64K limit, and users with color display monitors will see negative values in red. No price was quoted in the press release.

Personal Systems Technology (PerSyst), Inc., is one of several vendors who have announced dual-channel asynchronous communications controllers for the PC. This card allows two channels to occupy the same amount of space as, for example, the IBM card with only one channel. PerSyst claims two important advantages over their competition.

First, a jumper plug on the board allows the transmit and receive signals to be reversed, which is necessary if two computers are to be connected without modems in between.

Second, PerSyst claims to be unique by being the only vendor to supply the cabling required to bring the second channels connector to the outside of the system unit. Photo 3 shows the arrangement. The adapter costs $195 with two channels and $130 with a single channel. □

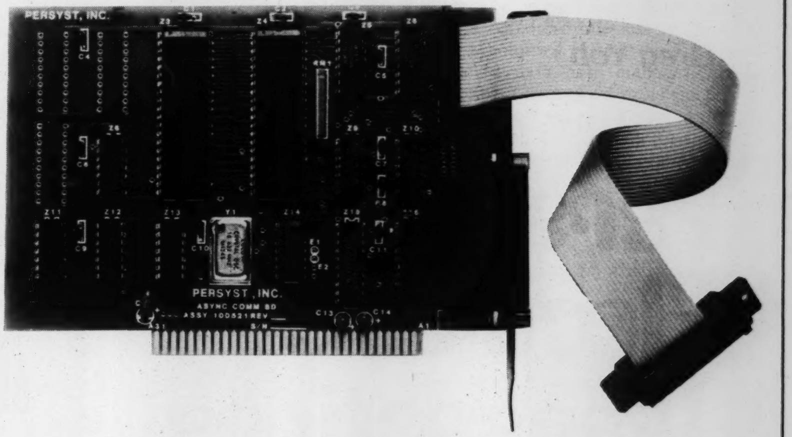


Photo 3. PerSyst, Inc.'s two-channel asynchronous communications board. The cable for the second channel is included.

Firms Mentioned in this Column:

Source Telecomputing Corporation
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Universal Data Systems
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Huntsville, AL 35805
(205) 837-8100

Hayes Microcomputer Products, Inc.
5835 Peachtree Corners East
Norcross, GA 30092
(404) 449-8791

International Data Corporation
5 Speen St., Box 955
Framingham, MA 01701
(617) 872-8200

Omric Corporation
1268 Main St., Suite 207
Newington, CT 06111
(203) 666-4240

Zeta Products
Box 147
Georgetown, TX 78626
(512) 863-3079

TG Products
P.O. Box 2931
Richardson, TX 75080
(214) 424-8568

Kraft Systems, Inc.
450 W. California Ave.
Vista, CA 92083

Lifetree Software, Inc.
117 Webster, Suite 342
Monterey, CA 93940
(408) 659-3221

Little Bit
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New Haven, CT 06511
(203) 865-1407

PC Products
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Albany, CA 94706
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Canada, L7T 3H2

PBL Corporation
605 Harmony Circle Dr.
Wayzata, MN 55391
(612) 473-3769

CompuView Products, Inc.
1955 Pauline Blvd., Suite 200
Ann Arbor, MI 48103
(313) 996-1299

Metamorphics, Inc.
154 Montgomery Ave.
Bala Cynwyd, PA 19004
(215) 668-9000

NEC Information Systems, Inc.
5 Militia Dr.
Lexington, MA 02173
(617) 862-3120

Computer Case Company
5850 Indian Mound Ct.
Columbus, OH 43213
(614) 868-9464

Sorcim Corporation
405 Aldo Ave.
Santa Clara, CA 95050
(408) 727-7634

Innovative Data Technology
4060 Morena Blvd.
San Diego, CA 92117
(714) 270-3990

Xedex Corporation
1345 Avenue of the Americas
New York, NY 10105
(212) 489-0444

Personal Systems Technology, Inc.
22957 La Cadena
Laguna Hills, CA 92653
(714) 859-8871

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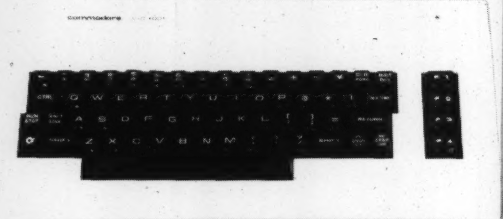


I am happy to hear from you, and encourage your correspondence. I will try to acknowledge all correspondence, and a SASE makes things easier for both of us. Please send your letters to "Personal Electronic Transactions" c/o PO Box 354, Palo Alto, CA 94301.

Every year it seems that Commodore introduces a new machine, and now that I have my 80-column PET and 8050 disk drives and VIC-20, Commodore has moved ahead to the Ultimax and the PET-64. I am told that there are some 300,000 PETs in the world and that this number will double every year.

In the face of this onslaught my three monthly pages isn't very much room in which to discuss things PET and I want to know what kinds of things you want to hear about. Please drop me a line and include an SASE if you want a reply.

Progress is especially rapid in the VIC world and if you manufacture VIC-oriented products or have VIC questions I particularly want to hear from you.

Some VIC Modifications

Color Enhancement. There is an unfounded rumor that the designers of the TV modulation circuitry for the VIC were color blind, and that some early models of the VIC do not produce vivid colors. Commodore offers an enhancement to the VIC (I believe at no charge — but check with your dealer) which improves the quality and colors of the TV image. It's worth checking out.

Faster Reset. If you already have a PET, you know that the machine is reset by flipping the power switch on and off, and that the PET returns to life about ½ second later. The VIC works the same way, but the return to life takes nearly two seconds, which seems quite a long time.

If you are *experienced* in working with PC boards, the cure is simple. Remove the 1 microfarad capacitator indicated in Figure 1 and replace it with a .22 or .33 uf capacitator instead.

I used a small mylar capacitator to ignore the polarity of the leads required by electrolytics. Now my VIC comes to life almost immediately (back to ½ second). As this project involves opening the case and removing the PC board, be aware that the modification will void your warranty. If you can't answer this question, *don't* attempt the project: What is an NE 555 and how is it used in the VIC?

RES and NMI Buttons. For most of us, pressing RUN/STOP + RESTORE is an adequate way to cure a "runaway" VIC. When RESTORE is pressed, the VIC is interrupted and the STOP key is checked for depression.

If both keys are down, the VIC executes a "warm start" which leaves your program in memory intact.

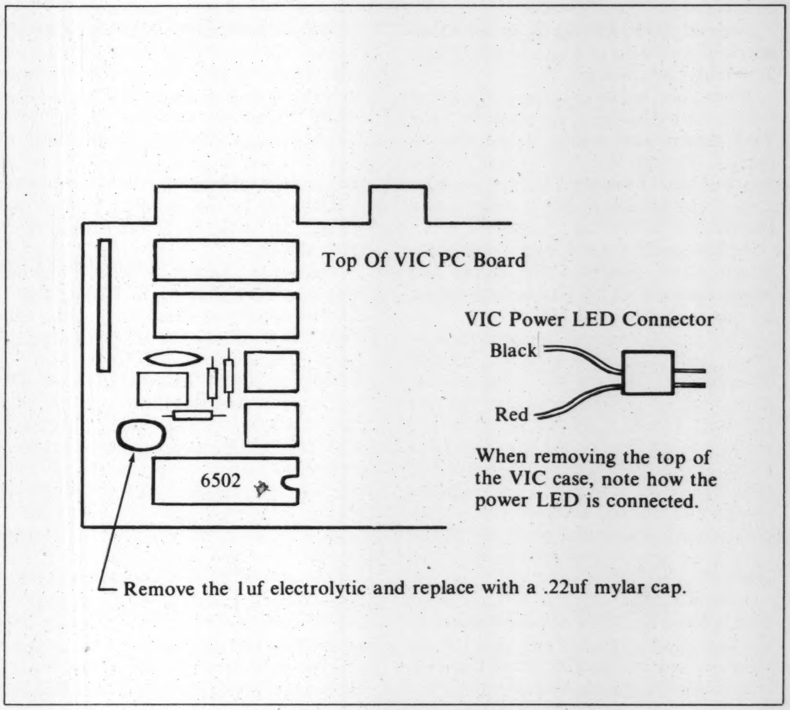
If you are machine language oriented, you know that the 6502 chip has two important lines, $\overline{\text{RES}}$ and $\overline{\text{NMI}}$ which interrupt the 6502 and can be used to recover from various machine language disasters.

In the VIC, $\overline{\text{RES}}$ acts the same way as turning the power off and on. The memory *is* cleared and the sign-on message will appear. $\overline{\text{NMI}}$ has no apparent effect in a VIC, but this can change if a suitable cartridge is inserted. I expect that machine language oriented cartridges (monitors and assemblers) will soon appear.

Figure 2 shows where you can find $\overline{\text{RES}}$ and $\overline{\text{NMI}}$ on the bottom of the VIC PC board. To install this option, take two normally open pushbuttons and mount them in the VIC case near the power LED. The wires can be run through the hole near the right side of the PC card used to mount the cartridge guide. When either pushbutton is pressed, the appropriate line is grounded and the 6502 will now do the RES or NMI sequences.

If you don't want to open the case, the Vector 3662 DIP Plugboard (about $8.00) fits in the VIC expansion connector. Mount the switches on the plugboard and connect to the pins labeled X ($\overline{\text{RES}}$), W ($\overline{\text{NMI}}$) and Z (ground) on the bottom of the plugboard.

By the way, don't bother with these buttons unless you will be programming the VIC in machine language.

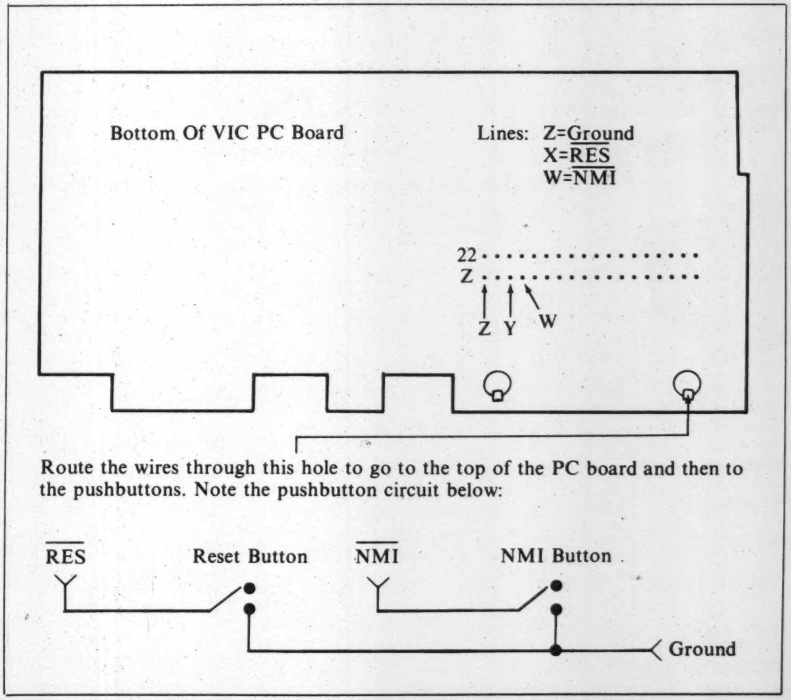


When removing the top of the VIC case, note how the power LED is connected.

Remove the 1uf electrolytic and replace with a .22uf mylar cap.

Figure 1. Changing The Power-On Capacitator.

Figure 2. Adding Reset And NMI Buttons.



Route the wires through this hole to go to the top of the PC board and then to the pushbuttons. Note the pushbutton circuit below:

Jinsam

The arrival of my 80-column PET heralded my entry into "serious" computing; at last I am using my PET for something practical!

I have known for some time that a computer could help me with the innumerable bits and pieces of information that seem to be required in contemporary life — all of those business transactions (get an accounting system) or all of those lists (get a data base manager) or my manuscripts (get a word processor).

As a modest start, I acquired *Jinsam* which is a data base system for the PET. *(Jinsam* is available for all versions of the PET and disk drives from Jini Micro-Systems, Inc., Box 274 Kingsbridge Station, Riverdale, NY 10463. (212) 796-6200. The version I am reviewing is the *Jinsam 8.0* Core system which carries a list price of $495.)

So what is a data base system? I have several piles of paper around the house with names, phone numbers, addresses and scribbled notes. I could write a series of programs which, 1) let me enter the information, 2) look at the information, 3) print summaries thereof, 4) update and change the date and 5) sort the information by some criterion.

When it is time to handle my phonograph record collection I am faced with these five tasks all over again. A data base system handles these tasks in a general way; each time I want to handle a new collection of information all I have to do is define the way in which the information is organized (name, address, phone or album, side, selection #1, selection #2, etc.) and then enter the data.

Once my names and phone numbers are in the computer, I can select portions for review or reports. I can look for the names in the range Burns to Carleton and print them in alphabetical order, or see if anyone has the phone number 332-4568.

If I want to look for information with the same set of selection rules, I can make a "key," which saves the re-entry of the selection criteria, and save it for later use. In a similar manner I can specify how a report will be formatted and save the format for re-use.

Jinsam arrived as a large binder containing the User's Guide, Master Diskette and a ROM. I had little difficulty working through the examples in the User's Guide, though it took about three hours to work through in detail. *(Jinsam* is a large system with many options and although the examples concentrated on just the major options, there is still a great deal of information.)

The User's Guide is, for the most part, clear and complete, including plainly stated warnings about where you might get into trouble. I would have liked a short description of the relationship between the data and the keys before the introduction

PET, continued...

of keys, but this is a small complaint.

The next step was to do something real. I chose to enter my names, addresses and phone numbers to make a personal "phone book" to replace those heaps of paper slips by the phone. Setting up the data base was very easy. These are the fields I chose:

1. Last Name
2. First Name
3. Home Phone
4. Business Phone
5. Company Name
6. Home Street/PO Box
7. City
8. State
9. Zip
10. Remark
11. Interest 1
12. Interest 2
13. Interest 3
14. Interest 4

The Remark let me add comments to remind me of the person's importance to my life or to hold unclassifiable data. The Interest fields let me make entries like PET, VIC, 8032, DOCTOR for later retrieval. For example, I can make a list of those people whose interests are PET and VIC only.

Then came the tedious part. I can enter about 40 names per hour at best, and it took me about three hours to enter about 90 names and addresses. Be prepared to spend some time doing the input part of a data manager.

Once all 300 names are in, I expect that keeping my file up to date will take about 20 minutes per month.

When you enter data into *Jinsam* it insists on redrawing the record on your PET screen and asking if the data is correct. Though this may appear to be a waste of time, I discovered errors in about 25% of my entries, so this is really a nice feature.

At last came the fun part. I created a report which presented the names and phone numbers on my printer, and there it all was in alphabetical order.

The User's Manual requests several times that you use completely checked diskettes and advises that you use the Commodore utility program for the checkout. I failed to do this and it was just my luck to get a faulty diskette when I was entering my data. When *Jinsam* tried to print my report, it would halt at the faulty record and display a screen full of dire commentary which amounted to "Please remember what happened so you can call us."

I found that Option 332, Review Sequential Records let me "browse" through the bad record and that I could then use the Edit option to fix the bad data. (Of course this was on a backup diskette.) Once all of the bad records were located and repaired my report ran perfectly.

(*Note:* The Commodore "Check Disk" program does a very incomplete job. If you have written a disk verification program that runs in machine language I would like a copy — and so would many others.)

Two small notes about *Jinsam*. First, if your database is of any size, be sure to calculate the number of records it can have as described in the manual. I made the mistake of defining a file larger than 180,000 bytes.

Jinsam asks for the number of records *after* you have defined the fields. Poof! I had to re-enter all of my fields again, and I did this *twice* before deigning to pull out my calculator.

Second, I find that the Basic 4.0 BACKUP command takes much less time than *Jinsam's* data base backup programs. Also, BACKUP copies the entire disk and not just the data part of one database. (You can have several databases on one diskette. Along with my names & addresses I maintain a list of official interests to help me when I am making searches.)

Though Jini MicroSystems does not list their phone number on the front page of the User's Guide, it appears in the advertising and I have found them to be very pleasant and friendly when asking questions, discussing bugs, etc. Jini has

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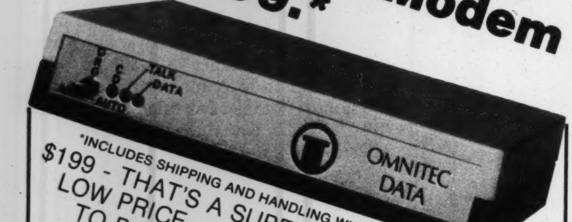

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numerous "accessory options" for statistics, mailing labels (beyond the one provided in the Core System), interfaces for *Wordpro* and *Visicalc* and so on.

There is also *Jinsam 8.2* which operates in machine language — and is much faster — and an "Executive" which lets you enter common procedures on to the disk for routine execution.

If you need a data base system, *Jinsam* deserves a good and careful look. I expect you will like it as much as I do.

Fixing Flaky Diskettes

If you get a diskette that behaves erratically or not at all, don't tear it up in a fury or use it to demonstrate the construction of floppy disks. I have found that about 80% of these "bad" disks can be fixed by demagnetizing them with a bulk tape eraser. Turn on the demagnetizer (in some remote place like the kitchen) and move it around the disk a few times, and then back away slowly. Though the diskette is now without data, I haven't had any problems with my rejuvenated diskettes. (The really bad ones won't format, and those I *do* consign to the shredder.)

If I get a box of virgin disks which won't format, the same treatment is often helpful. I suspect that some brands of diskettes aren't demagnetized after they are verified in the factory, and that the formatting operation may not completely write the diskette. Be sure first that the heads of your disk drive are clean; a speck of dust on the head will make all diskettes behave badly.

An 8050 Disk Bug

My 8050 disk drives hold 512K per diskette which is about three times as much as my 4040 diskettes do. The 8050 uses the 6502 processors just as the 4040s do, so the data transfer rates are the same. This means that routine tasks such as disk backup and formatting will take six minutes on the 8050 instead of the two minutes required by the 4040. With lightly used diskettes — say 300 blocks or less — I thought that the COPY D0 TO D1 command would take less time than the BACKUP D0 TO D1.

Sad to say, it didn't work. My 8050 would copy a few files and then flash its red error LED. An inquiry to DS$ gave me the mystifying:

```
29, disk id mismatch,39,01
```

Some experimentation revealed that the 8050 will copy up to eight files before giving the error.

As far as I can tell, the 8050 reads the first block on the directory (which holds information about eight files) and completes the copy of the files present in the first block. (If the block holds two scratched files, six files are copied and so on.) Then comes the error.

Commodore used to provide a COPY FILES program on its 4040 and 2040 demo disk. This program, of course, does not appear on the 8050 demo disk. Find a friend with a 4040 and get a copy of COPY FILES. (Remember that you can save it on tape, but check with the Monitor to be sure you have all of the program including any machine language parts.)

Musical Form	**VIC Entry**	**Screen Response**
Note A-G	A-G	A-G
Flat (♭)	F	FLAT
Sharp (#)	S	SHARP
Augmented (+)	A	AUGMENTED
Diminished (°)	D	DIMINISHED
Minor (m)	MI	MINOR
Major (M)	MA	MAJOR
Sixth (6)	6	6 TH
Seventh (7)	7	7 TH
Ninth (9)	9	9 TH

Since the note is entered first, there will be no confusion between the note and the other terms which are entered *after* the note. For minor and major, pressing M prints M on the screen. When I or A is then pressed, the response fills out to MINOR or MAJOR respectively.

Figure 3. Musical Chord Names on the VIC Keyboard.

VIC And The Frying Pan?

Before I had my VIC modified for better video, my TV set always had a moving herringbone type pattern in the VIC display which limited my visual tolerance to sessions of about 20 minutes. Then one day I put the video modulator box on top of my 8032 and discovered that the herringbones went away (and the colors were better too).

Well, my 8032 has a metal case, and some experimentation revealed that a piece of aluminum plate about 8" by 15" would work as well. Just lay the modulator box on its side on the plate, and if one way doesn't work, try the other way. I suppose any suitable piece of metal would work — perhaps even a frying pan.

Entry Routine For Musical Chords

I have a close friend who teaches guitar in junior high school and we were discussing how to use a small computer such as the VIC to help her students. The beginning guitarist frequently has trouble remembering where to place the fingers for the chords, and the idea of a slightly computerized guitar was hatched. One could have the teacher enter the name of a chord on the VIC keyboard, have the VIC draw the fingering diagram on the screen, and (sometime in the future) modify a cheap guitar so LEDs would glow between the frets to indicate the relation between the positions of the fingers on the fretboard and the fingering diagram.

This is a fairly large project, so we broke it down into several steps. The first reasonable goal was to enter the name of the chord and get the fingering diagram on the screen. This breaks down into 1) Enter the name of the chord, 2) look up the fingering data, and 3) display the fingering diagram. We will start with Step 1 in this column and continue this project in future columns.

I obtained a "Hal Leonard Guitar Chordisc" which is a circular cardboard pair of disks with the chord names on the outer edge and some holes in the inner disc with a fretboard diagram. By rotating the inner disk, the selected fingering will appear in the holes in the fretboard diagram. The chords are arranged in a standard order with some 20 chords for each of the notes A through G.

The symbols for flat and augmented aren't on the VIC keyboard, and the symbols M and m (major and minor) require using the Shift key to tell them apart *(and* going into Upper/Lower case mode). Figure 3 indicates how I chose to represent the chordism of the VIC keyboard. For example, the chord A Flat Minor Seventh would be entered as A F MI 7.

One way to do the entry is simply to enter a string, press Return and check the table of legal chords. This is easy for the programmer but is frustrating to the user because there is no feedback until Return is pressed.

I chose to provide two forms of feedback. First, when a chord is entered, only certain characters have any meaning at each level. For example, the first letter is limited to ABCDEFG and the second letter must be chosen from F S M A D 6 7 9 and Return. As letters are entered, they are checked against the legal list and the illegal ones are ignored.

The second form of feedback is to print on the screen an indication of the entry in progress. Type A and see A on the screen. Type F and get FLAT on the screen. Type M and see M on the screen. Type I and see the M grow into MINOR.

Figure 4. Allowable Chord Entries in Program 1.

Chords Found On Hal Leonard's Chordisc (In VIC Entry Form)

A

A6
A7
A9
AA
AD
AF

AMI
AF6
AF7
AF9
AFA

AMI7
AMA7
AMI6

AFMI7
AFMA7
AFMI6

Plausible Chord Entries

AS

AMA
AS6
AS7
AS9
ASA
ASD

AMA6
AMI9
AMA9

ASMI7
ASMA7
ASMI6
ASMA6
ASMI9
ASMA9
AFMI9
AFMA9

Note: The Chordisc is set up for the flatted versions of the enharmonic notes. Some of the sharp chords in the Plausible Entries list will be internally converted to the equivalent flatted chord. This will be done when the chord fingering table is consulted.

Rather than have the entry routine permit only the chords found on the Chordisc, I decided to use two steps. First, allow the entry of a plausible chord, even if it isn't a valid name — it must only look like a chord name. Second, check against the list of legal names.

Figure 4 indicates the legal and plausible chord names that are allowed by the entry routine. I found it simplest to write the list in Figure 4 first and then work out a pseudo-English description of the entry routine to program from. (Long experience with this kind of programming indicates that custom entry routines need a clear coding outline *first.*) Figure 5 is the final coding outline. Note that a few patches appear like Step 22.5.

Program 1 shows the resulting entry routine with some code to let you enter plausible chord names repeatedly. This program will run on all PETs and the VIC, so try it out. Line 4025 explains the composition of the PRINT string in Line 4030; I permit the DEL key for removal of the last entered letter and remove the prompt at the same time.

Correction

In the discussion of diskette holders in the July '82 column, I gave some incorrect information about the MM-1 steel diskette tray. (Postal Equipment Corp., 752 Military Rd., Buffalo, NY 14216.) The tray is 10" deep with steel and pressboard dividers and a vinyl dust cover, and sells for $33.50. □

Figure 5. Pseudo-English description of the parsing procedure used for the chord entry routine.

```
First Character Level
 1. Clear the M flag.
 2. Call Getkey Routine.
 3. Check for ABCDEFG.
 4. If Check fails goto Step 2.
 5. Accept into C$.
 6. Print the letter on the screen.
Second Character Level
 7. Call Getkey Routine.
 8. If we have RETURN, we are done.
 9. If we see DEL, call Erase Routine then goto Step 1.
10. Check for FSMDA679.
11. If Check fails goto Step 7.
12. Accept into C$. Call Response Routine.
13. Check for MFS.
14. If Check fails, we are done.
15. If we see M call Mprocedure.
16. If we see DEL, call Erase routine then goto Step 7.
Third Character Level
17. Call Getkey Routine.
18. If we see DEL, call Erase routine then goto Step 7.
19. If we see RETURN, we are done.
20. Check for 679DA.
21. If Check works, call Response, Accept into C$ and we are done.
22. If we see M call Mprocedure then goto Step 23.
22.5 Goto step 17.
23. If we see DEL, call Erase routine than goto Step 17.
Fourth Character Level
24. Call Getkey Routine.
25. If we see DEL, call Erase routine then goto Step 17.
26. If we see RETURN, goto Step 24.
27. Check for 679.
28. If Check fails, goto Step 24.
29. Accept into C$, call response, and we are done.
Getkey Routine
This is just the minimal GET loop.
Erase Routine
 1. Erase the current line on the screen.
 2. Remove the last character in C$.
Mprocedure Routine
 0. If M flag is set, return.
 1. Add the M to C$. Print M on screen. Set the M flag.
 2. Call Getkey Routine.
 3. If we see DEL, print to screen then Call Erase routine & return.
 4. If we see I, accept into C$, print INOR and return.
 5. If we see A, accept into C$, print AJOR and return.
 6. Goto Step 2.
```

The print to screen in Step 3 is needed as the M isn't printed with a carriage return on the screen.

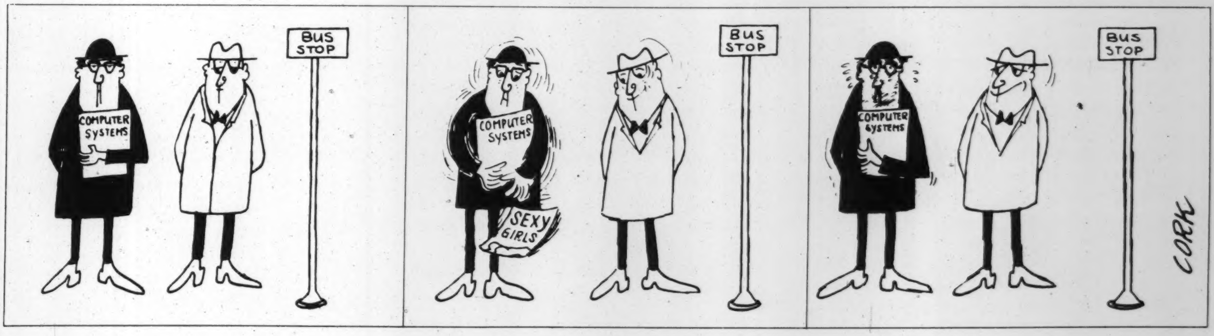
Response Routine

If the letter entered is in the table, print the appropriate response.

Letter	Response
F	FLAT
S	SHARP
A	AUGMENTED
D	DIMINISHED
6	6 TH
7	7 TH
9	9 TH

Program 1. Chord Parsing Program.

```
10 REM PROGRAM TO ENTER PLAUSIBLE MUSICAL CHORDS AND CHECK
20 REM FOR THEIR REASONABLENESS
30 REM
40 REM A$ = INPUT CHARACTER FROM GET ROUTINE
50 REM C$ = CHORD STRING
60 REM K$ = CHARACTERS TO CHECK FOR IN CHECK ROUTINE
65 REM MF = 'M' FLAG
66 REM CF = CHECK FLAG
70 REM
80 REM MAIN LOOP
90 REM
100 PRINT"ENTER A CHORD
110 PRINT
120 GOSUB1000
130 PRINT"YOUR CHORD IS: "C$
140 PRINT"PRESS KEY TO DO ANOTHER ONE"
150 GOSUB2000:GOTO100
160 REM
1000 REM ENTER AND PARSE FOR CHORDS
1010 REM
1011 REM FIRST CHARACTER LEVEL
1012 REM
1020 MF=0:C$=""
1030 GOSUB2000:K$="ABCDEFG":GOSUB6000
1040 IFCF=0THEN1030
1050 C$=C$+A$:PRINTA$
1060 REM
1070 REM SECOND CHARACTER LEVEL
1080 REM
1090 GOSUB2000:IFA$=CHR$(13)THEN RETURN
1095 REM CHR$(20) IS THE DEL KEY
1100 IF A$=CHR$(20)THEN GOSUB 4000:GOTO1020
1110 K$="FSMDA679":GOSUB6000
1120 IFCF=0THEN1090
1130 C$=C$+A$:GOSUB3000
1140 K$="MFS":GOSUB6000
1150 IFCF=0THENRETURN
1160 IF A$="M" THEN GOSUB 5000
1170 IF A$=CHR$(20)THEN GOSUB 4000:GOTO1090
1180 REM
1190 REM THIRD CHARACTER LEVEL
1200 REM
1210 GOSUB2000
1220 IFA$=CHR$(20)THENGOSUB 4000:GOTO1090
1230 IFA$=CHR$(13)THEN RETURN
1240 K$="679DA":GOSUB6000
1250 IF CF THEN GOSUB 3000:C$=C$+A$:RETURN
1260 IF A$="M" THEN GOSUB 5000:GOTO1270
1265 GOTO 1210
1270 IF A$=CHR$(20)THEN GOSUB 4000:GOTO 1210
1280 REM
1290 REM FOURTH CHARACTER LEVEL
1300 REM
1310 GOSUB2000
1320 IF A$=CHR$(20)THENGOSUB 4000:GOTO1210
1330 IF A$=CHR$(13) THEN 1310
1340 K$="679":GOSUB6000
1350 IF CF=0 THEN 1310
1360 C$=C$+A$:GOSUB3000:RETURN
1370 REM
2000 REM SIMPLE GET LOOP
2010 REM
2020 GETA$:IFA$=""THEN2020
2030 RETURN
2040 REM
3000 REM RESPONSE ROUTINE
3010 REM
3020 IF A$="S" THEN PRINT"SHARP
3030 IF A$="F" THEN PRINT"FLAT
3040 IF A$="6" THEN PRINT"6 TH
3050 IF A$="7" THEN PRINT"7 TH
3060 IF A$="9" THEN PRINT"9 TH
3070 IF A$="D" THEN PRINT"DIMINISHED
3080 IF A$="A" THEN PRINT"AUGMENTED
3090 RETURN
3100 REM
4000 REM ERASE ROUTINE
4010 C=LEN(C$):A$=""
4020 IF C THEN C$=LEFT$(C$,C-1)
4025 REM WE PRINT [CURSOR UP] 10 SPACES [CURSOR UP] HERE
4030 PRINT"
4040 RETURN
4050 REM
5000 REM M PROCEDURE ROUTINE
5010 REM
5020 IF MF THEN RETURN
5030 C$=C$+"M":PRINT"M";:MF=1
5040 GOSUB2000
5050 IFA$=CHR$(20)THENPRINT:GOSUB4000:MF=0:RETURN
5060 IFA$="I"THENC$=C$+A$:PRINT"INOR":RETURN
5070 IFA$="A"THENC$=C$+A$:PRINT"AJOR":RETURN
5080 GOTO5040
5090 REM
6000 REM CHECKING ROUTINE
6010 REM
6020 CF=0:K=LEN(K$)
6030 FORJ=1TOK
6040 IFA$=MID$(K$,J,1)THENCF=1:RETURN
6050 NEXT:RETURN
6060 REM
```



How to Write a Software Review

Stephen Kimmel

You say that the latest program from Geewhiz Software is the greatest thing since silicon chips? You say you have to tell the world about it? You say you wouldn't mind earning a little money at the same time? Then by all means sit down at your friendly neighborhood word processor and write an article for us. It is the loving reviews of the users that keep the computer revolution and this magazine on the march.

But first, let's give some thought to just what you're going to say and how you're going to write it. Getting your article published is the name of the game. There are a few rules that you need to follow. Keep these in mind and the sky is the limit. Ignore them at your own risk.

Selecting The Program

To begin you must select a program to review. While that may seem simple enough, there are constraints. What should you review for this magazine? Anything you like provided you are familiar with the subject. No one is interested in a review of an accounting program by someone who doesn't know a DCFROR from a checkbook.

The question is actually easier to answer the other way. In general, we prefer to avoid negative reviews. If you thought *Intralust* was the greatest waste of money you've ever seen, you have our sympathy and our agreement. Write off your loss as an educational expense and forget it.

We aren't interested in reviews that tell us how bad something is. If the program is that bad, it will probably have disappeared by the time we could print the review.

Similarly, we aren't interested in reviews of programs that are blatantly sexist or offensive. We don't want to encourage the people who write and sell them. The exception is the review of several similar programs most of which are worthwhile.

This does not mean that we are not interested in the negative points and weaknesses of a program. Very few programs are perfect, and your review will be more credible and more useful to readers if you mention specific things with which you had trouble or which fell short of your expectations.

No one is interested in a review of an accounting program by someone who doesn't know a DCFROR from a checkbook.

We probably aren't interested in a review of a program that has been around for six months or more. Usually we have either already run a review or we have one in the hopper. If you have just discovered how wonderful Scott Adams's Adventures are, great.

Enjoy yourself, but don't write the article immediately. First write a letter asking whether we would be interested. That will save everyone time and money.

For purposes of this article, I'll review *Asylum* from Med Systems. *Asylum* is a graphic adventure game set in an insane asylum. Although the review is short, it illustrates important points that apply equally well to all types of software.

There are two people involved in a successful review. The first obviously is you, the author. Without you there is nothing. No review. No vast wealth. No incredible fame.

But never forget the other person involved, the editor. The editor's job is, among other things, to select articles that the readers will want to read.

If the editor does a good job, the reader will buy the next issue. The readers are entertained, informed and get value for their money. The magazine makes money. The editor gets paid. You get to sell more reviews. Everyone is happy.

Let's begin to write the review. Your old friend, the editor is sitting across the table from you. She is busy, but out of friendship, she is going to take a few minutes to talk to you. The petty formalities (Hihowareyouhowsthekids? Finehowareyou?) are behind us.

Talk to your friend, but don't waste her time. If you want her to spend more time with you, you must catch her interest right away and show her that it will be worthwhile for her to spend some extra time with you. This is the frame of mind in which to begin writing a software review.

The Software Profile

Before we go any farther, let's stop for a moment to prepare the Software Profile—that little box that gives vital statistics of the program.

Name: Asylum
Type: Adventure
System: TRS-80 Model I or III
Format: Cassette or disk
Language: Machine Language
Summary: The high point of human civilization and an absolute necessity for every software collection.
Manufacturer:
Med Systems Software
P.O. Box 3558
Chapel Hill, NC 27514
Price: $19.95 for cassette, $22.95 for disk

We have the essential facts here but we've gone overboard. Remember that we want the facts about the program. We want your feelings, too, but there should be no doubt which is which. So let's rewrite

---

Stephen Kimmel, 4756 S. Irvington Place, Tulsa, OK 74135.

the summary to read: *A worthy challenge for experienced adventurers; well worth the price.*

The reader now knows the important things: The name of the program; how to order it; what it takes to run it; and a brief description and summary of your opinion of it. If he wants to read something else, fine. We have gotten our points across.

Illustration

This is also a good time to consider illustration. For most software, the presentation of the material on the screen—be it invading aliens or a general ledger menu—is an important part of the program. It is therefore, a very good idea to include a representation of the screen in our review.

Getting the screen photo or screen dump on a printer is a job that will eventually have to be done by someone. If we include a high quality illustration and short caption at the time we submit the review, our friend the editor will immediately notice that we have saved a small chunk of her valuable time and will be even more kindly disposed toward our article.

The Title

Almost all articles begin with a title so, we should consider that next. The title is the first thing most people see. It should catch their interest, tell them what the article is about and give them a feel for the tone of the article. The title can bias the editor either for or against you. Obviously, we want the editor to be biased in our favor.

Make a list of three to six possibilities. Modify common sayings if nothing better comes to mind. Throw in a couple straight ones and a couple that are silly. For our sample review, let's consider:

1. "Software for the Insane: Still Crazy After All These Years"
2. "The Ultimate Adventure"
3. "Asylum: The Next Best Thing to Being There"
4. "Computer Asylum"
5. "A Graphic Adventure for the TRS-80"

That last title is dry and flavorless, and could probably be used for any number of programs. Remember that we are writing for a popular magazine, not a technical journal. Besides, the reader would expect to see a program listing with this title. So we'll reject it.

Tell the reader about your personal experiences with the program.

"The Ultimate Adventure" is not only dry and flavorless but also pretentious and probably wrong. Readers will avoid this article like the plague. So out it goes too.

I really like "Software for the Insane..." It is witty. It attracts attention. But it tells the reader a lot more about the author than it does about the program. With some regret, we put it aside.

That leaves "Computer Asylum" and "Asylum, The Next Best Thing to Being There." Both make reference to the program. Both attract the reader's attention. Considering the strong points of the program, its three-dimensional graphics and its complexity, the second title seems better. We may go back and use "Computer Asylum" later.

The Lead

Now for the most important part of the article; the opening paragraph or "lead." Our friend, the editor is busy, remember? She'll be able to tell in the first 100-200 words whether we can write or not.

If we can't then she'll apologize and go back to work. If the article promises to be dull and boring, she'll slip it back in the envelope and send it back to us.

She wants articles that the readers will want to read. The opening paragraph or two must make her want to continue reading. They must promise her that it will be worth her valuable time to read it.

Amuse her. Catch her interest. Make her want to read. You have 200 words to do that. No more.

I was on the verge of premeditated compucide. My TRS-80 had drained my pocket book, broken my marriage, ruined my health and was showing signs of sucking my soul from the frail hulk that was my body. This had to end! The gremlins inside the hellishly glowing CRT had to be stopped. Then I discovered Asylum.

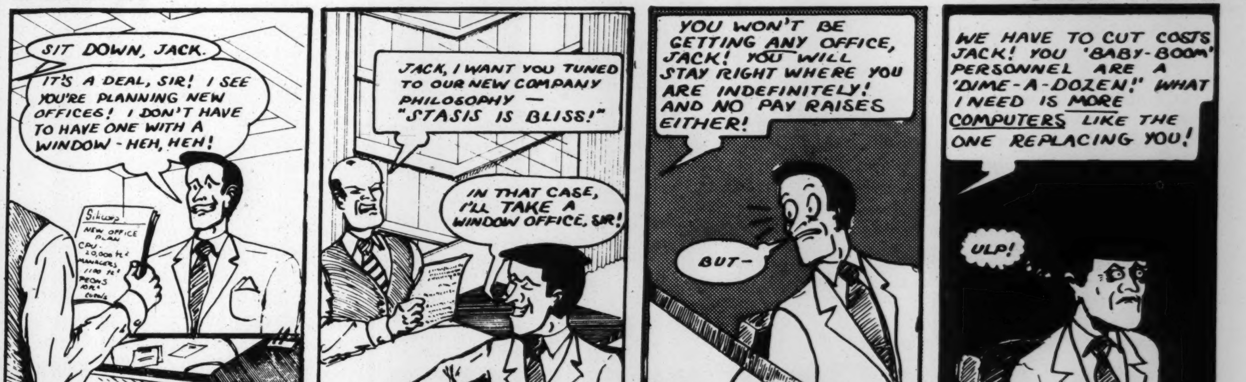
The language is colorful and it does catch your attention. It promises to be an interesting article. But it is heavy-handed and seems to go better with "Software for the Insane..." It would take a skillful touch to pull that off successfully. I don't think I'm up to it.

Adventures bore me. I've done them all and have a drawer full of dusty cassettes as proof. I have collected treasures until the world looks level. I had almost abandoned hope of ever being challenged by an Adventure puzzle when I discovered Asylum.

That's better. Our humorous tone is still there although we have dropped the sledgehammer approach. We have stirred the reader's interest. As an exercise in openings, pick a couple articles in this magazine and read the first few lines of each one. Which ones made you want to read more? Why? (For a complete discussion of leads, see "Effective Writing," in the December 1981 *Creative Computing.)*

Bit Pit

Chas Andres


SIT DOWN, JACK.
IT'S A DEAL, SIR! I SEE YOU'RE PLANNING NEW OFFICES! I DON'T HAVE TO HAVE ONE WITH A WINDOW - HEH, HEH!
Silicorp
NEW OFFICE PLAN
CPU 20,000 ft²
MANAGERS 1100 ft²
PEONS OR cubicle
JACK, I WANT YOU TUNED TO OUR NEW COMPANY PHILOSOPHY — "STASIS IS BLISS!"
IN THAT CASE, I'LL TAKE A WINDOW OFFICE, SIR!
YOU WON'T BE GETTING ANY OFFICE, JACK! YOU WILL STAY RIGHT WHERE YOU ARE INDEFINITELY! AND NO PAY RAISES EITHER!
BUT-
© 1982 ANDRES
WE HAVE TO CUT COSTS, JACK! YOU 'BABY-BOOM' PERSONNEL ARE A 'DIME-A-DOZEN!' WHAT I NEED IS MORE COMPUTERS LIKE THE ONE REPLACING YOU!
ULP!

Effective Writing, continued...

Describing the Program

Now we should expand on what the program does. Don't assume that everyone is familiar with the type of program being reviewed. While it may be obvious to you that DCFROR stands for Discounted Cash Flow Rate of Return, to many readers it may be something new and mysterious.

Although the majority of our readers have seen most of the major types of programs, there are always newcomers who haven't. Our goal is to bring the novices up to speed without boring the old hands.

In this adventure your assignment is simple: escape. To do that you must find your way out of a huge complex of corridors and rooms, fend off insane occupants and evade sadistic guards.

We have told the old hand some of the unique features of this program, and have given the novice an idea of what the game is like.

Now, describe the use or play of the program in as personal a way as possible. This is the section on which you will want to spend most of your time.

The key here is to avoid simply reprinting the instruction book and the advertisements. Tell the reader about your personal experiences with the program. At the same time be sure to include the things which make the program unique. Tell your good friend, the editor, what it was like to use the program.

My brother and I bought Asylum *to participate in Med Systems's annual contest. Our $19.95 was our entry fee in a contest for an Atari 400. About a week after we placed our order, the cassette arrived with eight pages of instructions that were simple and straightforward (unlike the commands for Temple of Asphai.)*

The parenthetical comment is uncalled for—so we'll strike it.

The cassette loaded on the first try and we were confronted with a reasonable, considering the graphic capabilities of the TRS-80, representation of a cell with a door in the far wall.

One press of the up arrow and almost instantly the door was close enough to touch. The down arrow turned us 180 degrees in place to show the bed.

The upper right hand corner showed a clock that slowly counted down the remaining time. And so to work. Not only did we have the built-in 8-hour time limit, we had only six weeks to get our entry—six weeks to solve an adventure touted as being nearly impossible. There was little time to relax.

We quickly settled into a pattern. I would work on the game in the early evening, and he would work into the night. In the morning we consulted and traded notes. Much of our work couldn't be transferred; mazes of this complexity can't be exchanged over the phone. Night after night we each worked an average of three hours on it.

It was as close to a full blown obsession as I have come. My wife complained. I was having trouble remembering my son's name.

Then Thursday came. I gave my brother the secret to stopping the crazed drag racer. Late that night he called me to read the congratulatory note. He had escaped from the Asylum almost exactly one week after we had started.

In retrospect, we figure it would have taken us 24 hours to complete Asylum *if we had been working separately. Working together, it took two seasoned adventurers just over 20 hours. An individual unfamiliar with adventure games might still be working on it.*

The bulk of our review is now done. Examine the checklist (Figure 1) to see if we have forgotten anything that would be appropriate for this type of program. We see that we could use a little more emphasis on the program itself and on our recommendation.

This is also the place to include generalized personal opinions. They should be appropriate to the subject matter. Otherwise you should leave them out.

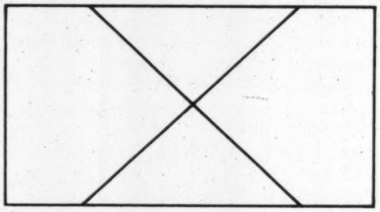
The Recommendation

The question arises: "How does Asylum *compare to the other adventure games?" In most adventures you seldom worry about getting totally, irredeemably lost. However, the mazes in* Asylum *are so much larger than most that this is a real possibility. The Scott Adams adventures have puzzles to solve that are more difficult and have a sounder internal logic. The humor in* Asylum *is sparse compared to adventure games I have played.*

OPEN
Dave Powell

The three-dimensional graphics put Asylum *in a class by itself. But is that a good thing? While I love computer graphics, I will readily admit my bias toward the written word. I believe that the written word activates the brain and turns on the imagination. Video displays tend to turn the brain off. Even the best currently available is miserable compared to an old Tom and Jerry cartoon. They can't compare to the power of your own imagination.*

Consider an example: "The corridor seems to fade away into infinity like a gaping mouth. You can almost hear the distant shouts of children long forgotten." Done in high resolution graphics that becomes



I rest my case.

All things considered, Asylum *is a worthy challenge if not for your cunning, then for your endurance. This program deserves a place in every collection.*

The Finishing Touches

After rewriting it and polishing it a little we will probably have an article that this magazine would be glad to publish.

Check your spelling and your grammar. If you have any doubt at all, look it up.

When you have it ready to go, type or print it with a good dark ribbon on good quality paper (not erasable bond) *double-spaced* on one side.

A brief note about printers: A manuscript done on a dot matrix printer is quite acceptable as long as normal rules for upper and lower case letters are observed.

A manuscript printed in all caps or single-spaced or (horror of horrors) both will receive scant attention from the busy editor.

When the manuscript is finished put it in an envelope with a self-addressed, stamped envelope (if you want it returned in case of rejection) and mail it via First Class mail. It is not necessary to register or certify the package, nor is it wise to economize by using Fourth Class.

Now it's all up to your good friend the editor and her staff. She may not take this review. Or the next one. But if you keep writing about products that interest her readers, she will eventually find something to her liking. Then you can start amassing that wealth and incredible fame. □

Program Review Checklist

1. Software Profile: Name, publisher, address, price and configuration requirements.

2. Briefly describe what the program does and the need it fills. Is it a job worth doing? Is the program worth the money?

3. Briefly describe the use of the program and your personal experience with it.

4. The program: Is it easy to use? Is it user friendly? Does it contain appropriate instructions, prompts, etc.? Does it have good error trapping? Does it accept bad input and give strange results? Are there any bugs? What are its major strengths and weaknesses?

5. The documentation: Is it easy to read and thorough? Is it sufficiently detailed to run all aspects of the program? Does it contain examples and suggestions for other uses? Could you quickly find a specific piece of information in it?

6. Recommendation: Does the program have staying power? Do you continue to use it? If your friendship depended on it, would you recommend this program to a friend?

7. Illustration: Screen photo or dump.

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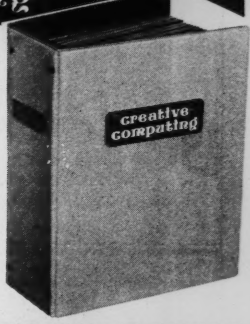

Are your back issues of *Creative Computing* stacked in piles? In boxes? Does the one you want always seem to be missing? If so, you need our binders. Made of vinyl with the *Creative Computing* logo silk screened on front and spine. Each holds 12 issues with sturdy locking wire posts. Just $7.95 each. Or save by ordering 3 for $22.50, 6 for $42.95.

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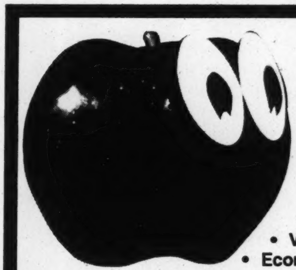


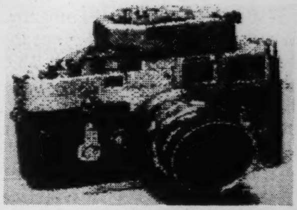
LET YOUR APPLE SEE THE WORLD!

The DS-65 Digisector® opens up a whole new world for your Apple II. Your computer can now be a part of the action, taking pictures to amuse your friends, watching your house while you're away, taking computer portraits . . . the applications abound! The DS-65 is a random access video digitizer. It converts a TV camera's output into digital information your computer can process. The DS-65 features:

- **High Resolution** — a 256 × 256 picture element scan
- **Precision** — 64 levels of grey scale
- **Versatility** — Accepts either NTSC or industrial video input
- **Economy** — A professional tool priced for the hobbyist

The DS-65 is an intelligent peripheral card with on-board software in 2708 EPROM. Check these software features:

- Full screen scans directly to Apple Hi-Res screen
- Easy random access digitizing by Basic programs
- Line-scan digitizing for reading charts or tracking objects
- Utility functions for clearing and copying the Hi-Res screen



HI-RES PICTURE USING THE DS-65 AND PICTURE SCANNER SOFTWARE

Use the DS-65 for precision security systems; computer portraiture; robotics; fast to slow scan conversion; moving target indicators; reading UPC codes, musical scores and paper tape and more! **GIVE YOUR APPLE THE GIFT OF SIGHT!** DS-65 Price: $349.95 / FSII Camera Price: $299.00 / Combination Price: $599.00

ADDITIONAL SOFTWARE FOR THE DS-65

—**Picture Scanner:** Provides a variety of different dithering algorithms for compressing the digitized image into the Hi-Res screen. Available on 13-sector disk. Price: $39.95

—**Superscan:** Enables you to enhance the DS-65's Hi-Res pictures with colors! Choose from 21 different colors and assign them to grey scale values, modify pictures, zoom, enhance contrast, etc. Print routines for the Anadex and Paper Tiger* are provided. Comes on a 13-sector disk. Written for The Micro Works by Magna Soft. Price: $79.95

—**Portrait System Software:** This program includes captions and a credit line, reverse printing for T-shirt application and the option to save portraits on disk. Specifically for use with a Malibu 165 printer. Call or write for more information.

*Paper Tiger is a trademark of Integral Data Systems, Inc.

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THE MICRO WORKS P.O. BOX 1110 DEL MAR, CA 92014 714-942-2400

CIRCLE 198 ON READER SERVICE CARD

COMPUTERS

COMPUTER COMBINES WINCHESTER DISK WITH CARTRIDGE TAPE DRIVE

A multiuser, table-top business computer that combines a 5 1/4" Winchester disk drive with a high speed cartridge tape drive in a single unit is now available from Dynabyte.

Designated the Dynabyte 5710, the product's tape back-up unit allows users to copy the information stored on the entire Winchester disk on to the tape in less than 15 minutes.

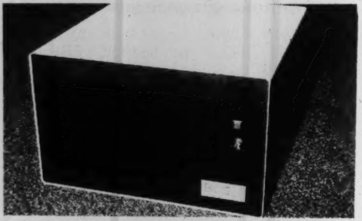
The 5710 offers CP/M, MP/M and OASIS, combined with, Basic, Cobol, Pascal, Fortran and PL/1.

The 5710 Model A1 with 10 megabytes of hard disk capacity and a 17 megabyte cartridge tape drive is priced at $8995, while the Model B1 with 16 megabytes of hard disk capacity sells for $9995.

Dynabyte, 521 Cottonwood Dr., Milpitas, CA 95035.

CIRCLE 301 ON READER SERVICE CARD

S-100 COMPUTER



Beavercreek Computer Systems announces an IEEE-compatible standard S-100 bus computer.

The single unit will include a heavy duty power supply, 8-slot motherboard, two Shugart 801R disk drives, 4Mhz Z-80 CPU, single and double density disk controller with standard IBM formats, 64K dynamic RAM, five serial ports under software control and a CP/M 2.2 operating system.

The computer unit is compatible with RS-232 CRT terminals and printers. $4299.

Beavercreek Computer Systems, 2465 Banyon Dr., Beavercreek, OH 45431. (513) 426-7670.

CIRCLE 302 ON READER SERVICE CARD

TERMINALS & I/O

ENHANCEMENTS FOR COMMODORE COMPUTERS

Small Systems Engineering, Inc. introduces CP/M, hard disk, and multi-user capability for Commodore PET and CBM microcomputers.

The SoftBox permits Commodore users to run CP/M compatible applications packages, and to interface with up to four Corvus Winchester hard disk drives. RS-232 interfacing capability is also included. $895.

HARDBOX
SOFTBOX
CBM

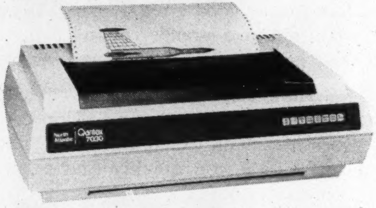
The HardBox, teamed one to a computer, will allow up to 64 users to access simultaneously the same Corvus hard disk storage—up to 80 Mbytes using the Corvus Constellation multiplexer. $695.

The Petspeed compiler allows Commodore Basic programs to run at up to 30 times their normal interpretive speed. $350.

Small Systems Engineering, Inc., 71 Park Lane, Brisbane, CA 94005. (415) 468-2900.

CIRCLE 303 ON READER SERVICE CARD

MULTIMODE PRINTER



Operating in one of five selectable modes, the Model 7030 Multimode Printer from the Qantex Division of North Atlantic Industries offers users the high speed of a data processing printer together with the letter-quality sharpness of a word processing printer and a graphics printer.

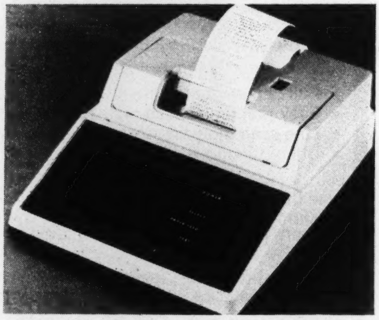
All modes are both switch-selectable and programmable, allowing the 9 x 9 serial dot-matrix printer to be used as an off-line print station or as a component of a data processing system.

Two interfaces reside in each Model 7030, a Centronics parallel and an RS-232 serial including a current loop. Interface selection is via a dip switch. $1995.

Quantex Division of North Atlantic Industries, 60 Plant Ave., Hauppauge, NY 11788. (516) 582-6060.

CIRCLE 304 ON READER SERVICE CARD

DESKTOP PRINTER



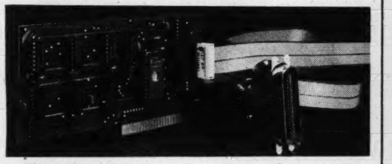
An Apple II-compatible dot matrix printer from Addmaster Corporation includes the Centronics type handshake and DB-25 interface connector. Designated Model 170, it provides 18 or 21 characters per line, six lines per inch print density on standard 2 1/4" adding machine tape.

Standard features include an internal three-line buffer, ASCII or Baudot input code (switch selectable), upper and lower case characters and an internal clock and calendar which can be used as an elapsed time indicator. $299.

Addmaster Corporation, 416 Junipero Serra Dr., San Gabriel, CA 91776. (213) 285-1121.

CIRCLE 305 ON READER SERVICE CARD

PRINTER INTERFACE



The PKASO Interface from Interactive Structures offers a way of expanding the intelligent text and graphics capabilities of the Apple computer and a variety of data printers.

The PKASO interface card offers grey scale printing or halftones, user created or software defined characters, and hi-resolution graphics.

The PKASO series is compatible with the following printers: Okidata Microline 80-83, Epson MX-70, Epson MX-80 with Graftrax, Epson MX-100, and Centronics Model 739.

Interactive Structures, Inc., 112 Bala Ave., P.O. Box 404, Bala Cynwyd, PA 19004. (215) 667-1713.

CIRCLE 306 ON READER SERVICE CARD

COLOR INK-JET PRINTER

PrintaColor Corporation has announced a dot-addressable, color ink-jet printer—the GP1024. The printer has the ability to operate on a pixel-by-pixel basis with an addressable plotting surface of up to 1440 points horizontally and as many vertically as the printing surface allows.

The GP1024 has two host-selectable, horizontal dot-densities and nine different pixel types, providing eighteen ways to define an image.

The printhead contains twelve jets (four per color) that deposit three colors—cyan, magenta and yellow. By over-printing and half-toning these basic colors, a full spectrum of color shades may be created. $5495.

PrintaColor Corporation, P.O. Box 52, Norcross, GA 30071. (404) 448-2675.

CIRCLE 307 ON READER SERVICE CARD

VIDEOTEX TERMINAL

A Videotex terminal, VP-3501, which includes both a built-in, direct connect modem for communication via the user's phone and a modulated RF output for

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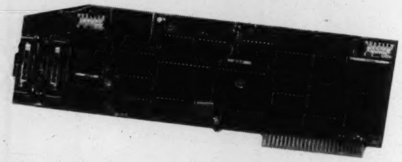
display of information on a TV has been announced by RCA MicroComputer Products. Features include color graphics; a resident ASCII or Dynamically Redefinable Character Set (DRCS); reverse video; a tone generator with subcarrier audio output for sound via the TV; a software selectable large character format and an expansion interface for peripheral devices.

The terminal includes both a 58-key alphanumeric keypad with two user keys and a 16-key calculator format keypad for fast numeric entries. Both use flexible-membrane keyswitches. $399.

RCA, Box 3200, Somerville, NJ 08876. (717) 397-7661.

CIRCLE 308 ON READER SERVICE CARD

VERSACARD FOR APPLE II



Versacard for Apple II includes a serial input/output interface, clock/calendar, and BSR control on one card.

The circuit design makes the Apple "think" that separate cards are installed, a feature which allows the interface ports to be compatible with Apple Pascal, Microsoft Softcard, and most other Apple software.

The serial input/output port is RS-232C standard, and terminal mode permits output to both printer and display simultaneously.

Onboard firmware provides optional auto line feed, video, paging, lower to upper case, and 8th bit set or clear. $249.

Prometheus Products, Inc., 45277 Fremont Blvd., Fremont, CA 94538.

CIRCLE 309 ON READER SERVICE CARD

PRINTER FEATURES MODULAR OPTIONS

A modular, field-upgradable dot-matrix Prism Printer was recently introduced by Integral Data Systems.

Available options include automatic cut-sheet feed ($149), Dot Plot graphics ($99), Prism Color (color printing capability) ($399), and Sprint Mode high-speed printing ($99).

Integral Data Systems, Inc., Milford, NH 03055. (603) 673-9100; (800) 258-1386.

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TYPEWRITER INTERFACE

Escon Products, Incorporated, announces The Electric Connection, which allows IBM and Olivetti typewriters to be driven by any mini or microcomputer.

A single board microcomputer controls all interface and printing operations. Parallel (Centronics-compatible) and RS-232 Serial computer outputs can be connected to the interface units.

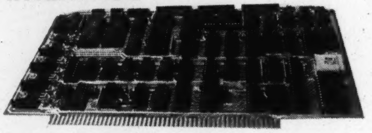
Dip-switch selection provides control over both mode and option choices.

Price of the system is $435; $465 for use with the IBM Personal Computer.

Escon Products, Inc., 12919 Alcosta Blvd., San Ramon, CA 94583. (800) 227-2148; in CA, (415) 820-1256.

CIRCLE 311 ON READER SERVICE CARD

SERIAL/PARALLEL I/O INTERFACE



SSM Microcomputer Products Inc., has introduced the IO5, a combination serial/-parallel input/output board.

The IO5 offers two asynchronous RS-232 serial interfaces and header selectable variable baud rates (110 to 19,200).

It also offers three parallel ports, including a bi-directional, programmable port with 16 data lines, an 8-bit input interface for general purpose data entry (e.g. ASCII keyboard); and an 8-bit output interface for compatibility with all Centronics devices. $329.

SSM Microcomputer Products Inc., 2190 Paragon Dr., San Jose, CA. (408) 946-7400.

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Tractor (OKI 80 + 82 only)	$60
Diablo 630	$2044

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Sanyo 12" GRN Phosphor	$266
Sanyo 12" Black + White	$239
Amdek 12" 300 GRN Phosphor	$164
Amdek 12" Color	$344
NEC 12" GRN Phosphor	$164
NEC 12" Color	$344

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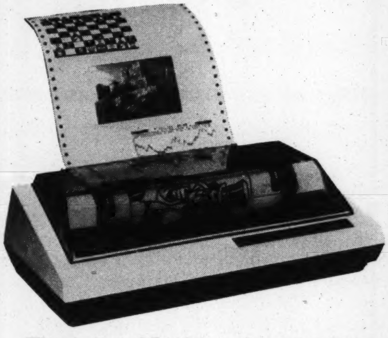
CIRCLE 214 ON READER SERVICE CARD

DOT MATRIX PRINTER



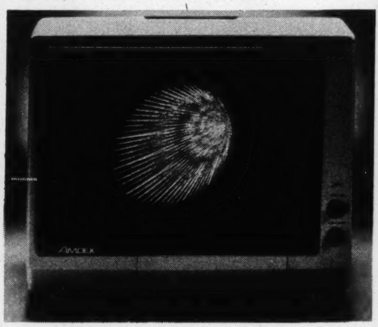
The Axiom GP100 is an impact printer with a single heavy-duty print hammer. The printer uses standard fanfold paper, up to 9 1/2" in width and allows dot graphics, alphanumeric characters and double width characters to be mixed within a single line.

In addition to the GP100 printer itself, Axiom offers computer interfaces to allow quick connection to all small computers, including Apple, TRS-80, PET, HP, and others. $389.

Axiom Corporation, 1014 Griswold Ave., San Fernando, CA 91340. (213) 365-9521.

CIRCLE 313 ON READER SERVICE CARD

COLOR VIDEO MONITOR



Amdek Corporation announces a 16-color, high resolution, Color II Monitor which is directly compatible with the IBM Personal Computer. The 13" TTL RGB video monitor has 80 x 24 character display capability and 560 x 260 resolution. An access cable for the IBM PC is included.

Amdek also recently introduced its DVM (Digital Video Multiplexor) Interface Board which makes Apple II computers compatible with the Color II. Access cable for the Apple II and III is also included.

The DVM is software programmable to allow transparent operation and is parallel with Apple text and graphic modes. It has four channels, three of which can multiplex the existing Apple text. The fourth channel makes the 80-character line video board possible.

The Color II retails for $999 and is available at Computerland and IBM computer centers as well as other computer stores across the country.

CIRCLE 314 ON READER SERVICE CARD

APPLICATIONS SOFTWARE

WORDPRO 5 PLUS AND 2 PLUS

Professional Software introduces *WordPro 5 Plus* which creates a word processing system with separate text areas. Multi-user capability (up to eight workstations) is available with the addition of a multi-user interface device.

WordPro 5 Plus operates with many business-oriented programs, including DataPlus, Professional Software's Information Management program.

WordPro 5 Plus is designed for use on the Commodore 8032 computer with 64K Memory Expansion Board installed. Any CBM disk drive may be used for document storage and any properly interfaced ASCII letter-quality or dot matrix printer may be used. $450.

Also available is *WordPro 2 Plus*, which requires a minimum of 16K and is sold complete with cassette and diskette versions and is fully compatible with most CBM computers. Its flexibility and price are geared towards educational institutions. $199.95.

Professional Software, Inc., 51 Fremont St., Needham, MA 02194. (617) 444-5224.

CIRCLE 315 ON READER SERVICE CARD

GRIDLOCK

Recently a malfunction of traffic lights in midtown Manhattan created a classic case of gridlock on several one-way streets and avenues. In other words, vehicles entered intersections without being able to get across thus blocking traffic in other directions.

Dodgem is a game based on a gridlock. In the game, two players try to maneuver from three to eight vehicles across an intersection, one south to north, the other west to east. Each player attempts to keep his lanes open while blocking his opponent.

Sound easy? It's not. **Dodgem** can be played against the computer or a human opponent.

Dodgem is one of nine games in the **Apple Games Pac**, a collection of strategy and action games. Other games on the disk include **Nuclear Reaction** (a challenging high-tech version of Roman checkers), **Brickout** (knock down a wall—four skill levels), **Blockade** (two players each build a trail of walls), **Torpedo Alley** (destroy enemy ships with torpedoes from your submarine), **StarWars** (zap the TIE fighters—a joystick helps!), **Rocket Pilot** (land in rough terrain), **Saucer Invasion** (your SAM missiles against the devious saucers) and **Genius** (a fast-paced, timed trivia quiz).

Disk CS-4507 is $19.95. Requires 32K Apple, disk, DOS 3.3 and paddles and/or joystick. To order send payment plus $2.00 postage and handling to Creative Computing, Dept. C826, 39 E. Hanover Avenue, Morris Plains, NJ 07950. Orders may be charged to your Visa, Mastercard or American Express account — by mail include credit card name, number and expiration date, or use our toll-free number, 800-631-8112. In NJ only 201-540-0445. NJ residents add 5% tax.

Super Paddles with massive firing button are also available at $39.95 plus $2.00 postage and handling. Also our sensational Joystick at $59.95 plus $3.00 postage and handling. Ordering information same as above.

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CIRCLE 231 ON READER SERVICE CARD

iews...book r

Basic Programming Primer, by Mitchell Waite and Michael Pardee. Howard W. Sams & Co., Inc., Indianapolis, IN. 236 pages, $10.95. 1978.

For the past four years I have been teaching a course in Beginning Basic Programming at Marin Computer Center. When *Basic Programming Primer*, by Mitchell Waite and Michael Pardee came out we immediately adopted it as the text for our course. Since then I've had the opportunity to watch approximately 500 students successfully use *Basic Primer* as a welcome companion text to an introductory programming course. This is a book that really is what it says it is, a primer, which according to Webster's means, "a textbook giving the first principles of any subject." It presupposes no prior knowledge of computers by the reader and really does begin at square one.

Right from the beginning the book is unique because Waite and Pardee don't just jump right into the teaching of programming. Instead they take the time to provide a panoramic overview of computers focusing on practical applications. This is great, because not only are they answering the obvious question of "Why should I bother to learn about computers?" but they do it in an enthusiastic way that is positively contagious.

Learning is a journey, and Waite and Pardee have thoughtfully made all the steps along the way small enough so as not to intimidate even the most timid of travellers. Some visible evidence of the light touch used here to teach is the book's illustrations. Robert Gumpertz's cartoon-like drawings do much to personalize the relationship between people and computers.

After studying this book, you should be able to FOR/NEXT, ON/GOTO and PEEK and POKE with great ease. Although all the programs presented were written on an Apple computer, the authors carefully avoided Apple's specific features. Therefore the programs are readily transferable to any microcomputer.

This is the kind of book, rare among technical texts, whose writing is clear and palatable enough to actually be read from cover to cover. (Even the sample programs come complete with sample "runs" which precludes the necessity of having a computer in order to see how the example works.) However, the best way to read *Basic Primer* is while sitting not more than an arm's distance from a microcomputer.

Generally speaking, the explanations of the programming concepts were provided in a clear and down-to-earth manner. The sample loan, metric conversion, and Tic Tac Toe programs offered in the book were nicely presented and very well documented. Fine points of programming like menus, error checking and remark statements are extremely well described and illustrated. The way the authors equated the concept of arrays to slices of raisin bread was pure genius.

I must admit, however, that there were certain mathematical principles of Basic presented in this book whose explanations did not cause the proverbial light of understanding to flash, at least not in my head. Suffice it to say that the whole section on numeric functions left me feeling rather dizzy.

It should be obvious by this point that I like *Basic Primer* very much, but I did notice a few things that could be improved. For example, in the section about ON GOSUB there was a series of typographical errors that made understanding the explanation of the preceding program somewhat difficult.

And while I'm balancing all the book's positive aspects with a little constructive criticism I do want to mention the tear-out reference card in the back of the book. It was a great idea to provide the reader with a portable security blanket to take with him to the computer. It also makes sense to carry a reference card of Basic commands instead of the book itself. The problem is that the printing on the card is so small that one would need a magnifying glass to read it.

It's great to know that there is a book that does an excellent job of de-mystifying the whole study of computer programming in Basic. *Basic Programming Primer* is that book and it was written to offer people a painless and enjoyable way to ease into the computer programming age.—*Annie Fox*

Science Observed by Jeremy Bernstein. Basic Books, Inc. New York. 1982. 376 pages, $16.95.

The first impression given by this three-part collection of essays, gathered from such diverse publications as the *New Yorker*, *Geo*, and *American Scholar*, is a feeling of awe. A quick scan reveals many magic names—Minsky, Einstein, Dyson, Whitehead, and Papert to name a few—and one can almost imagine a signpost reading "Here there be giants" pointing to the depths of the volume.

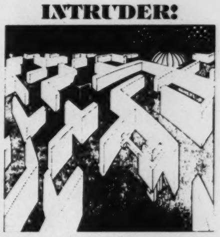
The first part covers artificial intelligence, focusing on the work of Marvin Minsky and his colleagues at M.I.T. This is followed by a series of essays under the general heading "Science Observed." Finally, a section called "Out of My Mind; Entertainments, Serious and Otherwise" completes the book.

Unfortunately, any awe to be derived from the book must be supplied by the reader. While Bernstein knows his topics, his attempts to avoid sensationalizing or over-popularizing science leads to a lack of fire in his writing. He manages to convey facts well, especially when recounting the history of artificial intelligence, but there is no spark. The excitement of science, the suspense, discovery, joy, and enthusiasm, are lacking from this work. That is not to say the book is without value.

The section on AI gives much good background on the field. The essays on time and on fusion are interesting and informative. But, as a whole, the book is unlikely to inspire anyone to go forth and learn more about any of the topics covered. And this is what any science book should do; it must fire the urge to explore; it must cause the reader to devour the topic.

Another failing of the book becomes apparent in the second and third sections. While the author presents a wealth of facts and anecdotes, he doesn't go anywhere. The conclusion of almost every essay leaves the reader with a feeling of "Is that all there is?" A writer of popular science must have the same feel for pace and structure that has been mastered by authors of short stories and novels. Bernstein's essays have a beginning, middle, and end only in a physical sense. There is no sense of story here.

INTRUDER!



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CIRCLE 228 ON READER SERVICE CARD

.book reviews.

If you are already in love with science, the book will provide a pleasant evening or two in the company of many of this century's greatest minds. But if you want fire, you'd better bring your own matches.—*David Lubar*

PET Fun And Games by Ron Jeffries and Glen Fisher. Osborne/McGraw-Hill, 1981.

Institutions are short-lived in the personal computing world. As a loyal subscriber, I recently received a letter announcing the end of *Cursor*. They said: it has been fun, but we cannot go on; there are too many PETs, and that means too much debugging; besides Commodore is coming out with some much better machines, and we want to be ready.

For those of you who may have missed it, *Cursor* was programs by subscription. Each month—eventually every other month—a subscriber would receive a tape with five or six programs on it. Most of them were games that could be played on the PET/CBM, but there were also small text editors and other practical programs. From 1978 through 1982 *Cursor* produced more than 175 programs for our enjoyment and benefit.

Cursor has not, however, died without leaving a trace. The inventive people behind *Cursor*, Ron Jeffries and Glen Fisher, have published a book of 31 of their best games. In keeping with their tradition, the games are very inexpensive—$0.33 per game. You do have to type the code, but if you cannot stand that you can get the programs on tape or diskette for an extra charge.

The games are divided into six categories: action games; puzzles; games of risk; games of strategy; games of chance; and games of fun. Some of these are PET/CBM versions of well known games; Blackjack, Yahtzee, Dungeon, Reversi, and Hanoi, for example, are very well known games.

Others are either unique or much less well known than these standard games. The action games are: Zap, Shark, Demon, Ferry (through space), Bat, and Nab. The puzzle games are; Hanoi, Box, Mind, Peg, Leap, Slide, and Ratrun.

The games of risk are: Maze, Dungeon, Everest, Godzilla, and Fire. The games of strategy are: Dots, Reversi, Piegram, Cops, and Spot. The games of chance are: Black Jack, Yahtzee, Bonzo, and Boswain. And the games for fun are: Mad, Quix, Bop, and Face.

In a market where games seem to be selling for from $7 to $40 can games at $0.33 really be worth even that? During the summer of 1981 I ran a computer camp for junior high school students. I received permission to use all of the *Cursor* games during the camp. The students produced some rather interesting programs on their own, but they also found these games very intriguing.

My own favorites are Hanoi and Nab. Hanoi because it has such clean graphics, and Nab because it is a very fast-moving action game. But my own "market testing" tells me that in selecting the programs for this book Jeffries and Glenn did an excellent job of picking those that were most often played by my students.

There is something here for almost every taste. It is very unlikely that anyone wanting to play games will be disappointed with this book.

Farewell, *Cursor*. You have left us with a rich legacy. —*G. R. Boynton* □

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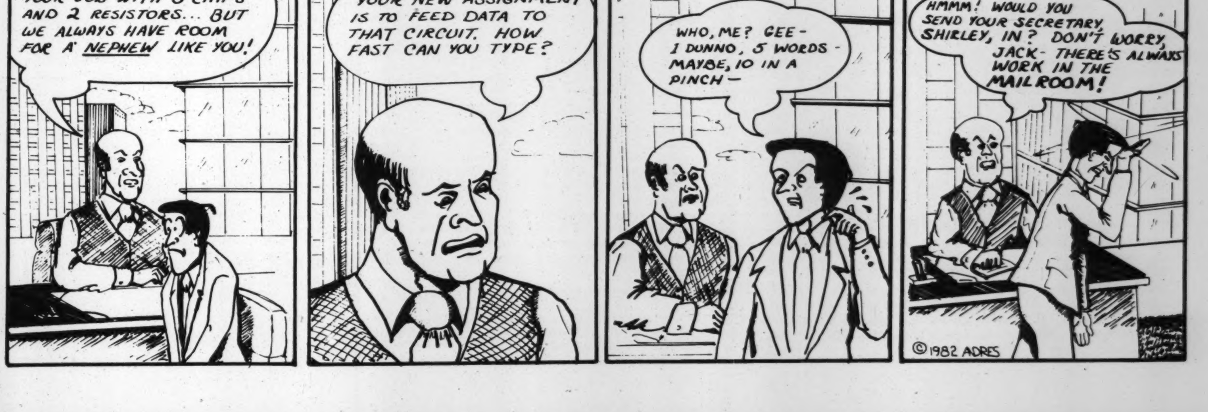
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COMPUTER PUBLICATIONS

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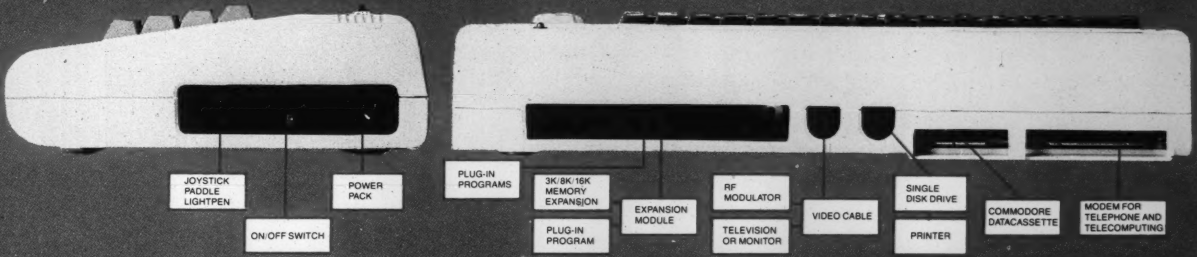
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VIC-20® VS. OTHER HOME COMPUTERS

Product Features	Commodore VIC-20	Atari® 400™	TI® 99/4A	TRS-80® Color Computer
Price*	$299.95	$399.00	$454.00	$399.00
Maximum RAM Memory	32K	16K	48K	32K
Keyboard Style	Full-Size Typewriter Style	Flat Plastic Membrane	Full-Size Typewriter Style	Calculator Style
Number of Keys	66	57	48	53
Programmable Function Keys	4	0	0	0
Graphic Symbols On Keyboard	62	0	0	0
Displayable Characters	512	256	192	256
Microprocessor	6502	6502	TMS9900	6809
Accessible Machine Language	YES	YES	YES	YES
Upper/Lower Case Characters	YES	YES	YES	NO
Operates with all Peripherals (Disk, Printer and Modem)	YES	NO	YES	YES
Full Screen Editor	YES	YES	YES	NO
Microsoft Basic	Standard	N/A	N/A	$ 99.00
Telephone Modem	$110.00	$399.95	$450.00	$154.95

*Manufacturer's suggested retail price Mar. 1, 1982

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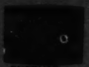
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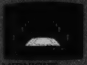
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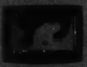
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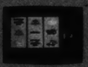
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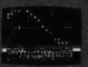
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[1] April '81 issue [2] May '81 issue [3] November '81 issue [4] Fall '81 issue

VIC-20
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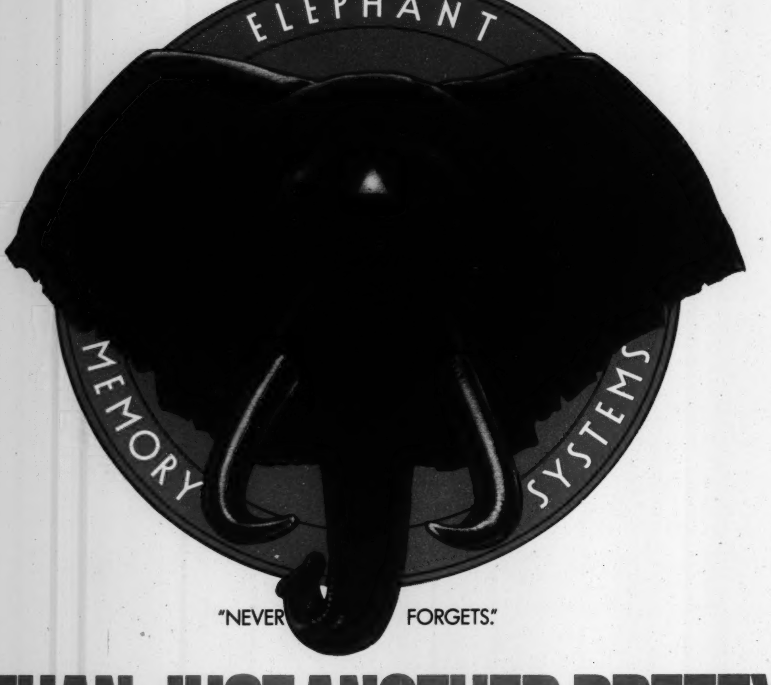

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